

POPULAR Computing WEEKLY

35p 20-26 October 1983 Vol 2 No 42

This Week

Spectrum games

Andy Pennell casts his fingers over another selection of Spectrum software including *Chuckie Egg* from A&F Software. See page 14.

Flowcharts

Noel Williams explains the importance of computer flowcharts in designing efficient programs on page 17.

Dragon Rom

Peter Whittaker shows how to call Rom routines from inside machine code programs. See page 18

New releases

All the latest software games including *Corridors of Genon in 3D* by Malcolm Evans and *Cylon Attack* from A&F. See page 53.

★ STAR
Icarus on
unexpanded Vic20
See page 10.
GAME★

News Desk

ZX Microdrive still in short supply

ALMOST three months after its launch, the Sinclair ZX Microdrive is still in short supply.

Also, the first commercially available Microdrive software is now unlikely to appear this year.

Following the launch of the Microdrive in July, Sinclair has been sending out batches of Microdrive order forms to

existing customers in strict order of original Spectrum purchase.

A spokeswoman for Sinclair commented last week: "We are admittedly still very near the top of the list."

"The Microdrive is still in its early stages of production. We always knew that, initially, numbers would be limited."

Continued on page 5



Texas changes tack

TEXAS Instruments, one of the struggling American micro giants has decided that a new approach is needed.

Having tackled the hardware problem by cutting the price of its ageing 99/4A computer to £99, it has now made changes on the software side.

Texas, noted in the past for its unwillingness to divulge the technical details of its machines to independent software houses, has relented.

The company has announced 15 new games cartridges written by some of the best-known US games and educational companies. Among them are Broderbund, Sega, Imagic, Sierra On-line, Scott Adams, Milton Bradley and Fox Video Games.

On the education side, TI has teamed up with Addison-Wesley and a British company, Ivan Berg Software.

Included in the first batch of six for the UK is *M.A.S.H.* from Fox, based on the film and tv series.

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All submissions should be typed and a double space should be left between each line. Please leave wide margins.

Programs should, whenever possible, be computer printed.

We cannot guarantee to return every submitted article or program, so please keep a copy. If you want to have your own program returned you must include a stamped, addressed envelope.

Accuracy

Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish, although we will always try our best to make sure programs work.

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Editorial

Mainstream book publishers are finally moving into the computer market in a big way.

Penguin has announced a range of twin book/cassette titles, including the enormously popular *Warlock of Fire-top Mountain* by Steve Jackson and Ian Livingstone of Games Workshop. Other titles include *The F-Plan Computer Pack* and *The Korh Trilogy*.

Pan, through its link with computer publisher VNU, has already launched four titles, with six more to follow before the end of the year. Longman has set up a software division with 11 educational programs for young children. Collins Educational has produced a series of packages around Michael Bond's *Paddington Bear*. Websters is launching a 400-page software directory.

Computer books are no longer 'small time' — they are now recognised as a valuable sector of the book market. However, while the entry of traditional publishers into the computer market should result in an improvement in quality, there is still some way to go. Too many books are still appearing in the form of '20 best games for your ...'.

The key to success in the computer book market lies not just in marketing and distribution, but also in the ideas behind the books.

Next Thursday

Play Bug Attack and build a brick wall around the queen bug by picking bricks up from the bottom and taking them to the top — but avoid the other bugs. **Next week's star game** for Dragon 32 by Mark Sach.

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The ADVENTURES of MONTY The Mountaineer

De Apibus Semper Dubitandum Est.

"AVALANCHE!"

MONTAGUE MONTAGUE III DUKE OF BOUTON HAS ORGANIZED AN EXPEDITION TO CLIMB MOUNT EVEREST. BUT MONTY AND THE TWO OTHER BRITISH CLIMBERS, IAN AND TOM, DID NOT RETURN TO CAMP THE PREVIOUS NIGHT. THE AMERICAN, HANK, TAKES CHARGE OF THE SEARCH PARTY.



"LEE, YOU GO WITH FRED BACK TO BASE CAMP AND GET MORE SUPPLIES. CARL AND I WILL SEARCH FOR THE OTHERS."

"SURE THING, HANK! WE'LL SEE Y'ALL BACK HERE LATER."

"GUT, DIS MAY VELL BE MY CHANCE TO DISPOSE OF ZIE SCHWEINHUND AMERIKANER!"

NOT FAR AWAY MONTY, TOM AND IAN ARE TRAPPED AT THE BOTTOM OF A CREVASS.

"DASHED LUCKY REALLY THAT THIS FISSURE HAS SHELTERED US FROM THE WEATHER. YOU SHARE THE LAST GINGER NUT, CHAPS. I AM SURE THAT AID IS IMMINENT."

"HAVE THE GINGER, TOM. I'LL TAKE THE NUT."

MEANWHILE, AT THE TOP...

"LOOKY HERE WHAT I'VE FOUND, CARL. MONTY'S HAT. THEY MUST BE TRAPPED BELOW."

"AND IN A MINUTE, SCHWEIN, YOU WILL JOIN ZEM IN OBLIVION."

SUDDENLY THE TWO CLIMBERS HEAR A NOISE ABOVE THEM.

RUMBLE
"GOTT IN HUMMEL!"

"WATCH OUT, AVALANCHE!"

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SOFTWARE

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ZX Microdrive

Continued from page 1

She declined to disclose the number of the devices supplied to customers so far: "We are, however, very happy with — the take-up rate from Spectrum owners — the drive has been greeted with enthusiastic response."

No date is yet available for the launch of the first Sinclair-brand software for the Microdrive.

Psion, the software house which has worked closely with Sinclair in the past and might be expected to be one of the first companies to support the Microdrive, has no plans to do so until early 1984.

Commented Psion's David Potter: "The problem at the moment is not the Microdrives themselves, but a shortage of blank micro cassettes. We would need hundreds of thousands a month to meet demand and Sinclair's subcontractors are the only people with the sophisticated machinery to manufacture them."

"That is in Sinclair's hands to sort out."

"Notwithstanding a few teething difficulties with the Microdrives I feel reasonably confident that, after they have been sorted out, we will produce Microdrive software in the early part of next year."

"But, at the moment, it is too early for us — and others — to do so," he added.

Shot by his own gun



THE Stack Light Rifle converts your home into a shooting gallery.

Using the light rifle connected to a computer in conjunction with specially written software you can shoot targets which appear on screen.

The rifle works in the same way as a light-pen. The computer can tell exactly which part of the screen the rifle is pointing at by finding the time from starting a new tv scan to

Silversoft partners in split

THE two founders of the long-established software house Silversoft have split.

Dave Patterson has left to set up a new company, Screen Play, leaving Dougie Bern to continue to run Silversoft.

Dave Patterson blamed personal differences for the split. "It really came down to individual values — it reached the point when I was just not enjoying it, when that happens it's time for a change," he commented.

Now Dave has established Screen Play, based in the heart of Glasgow, which will produce material for the BBC, Dragon, Commodore 64 and Spectrum computers.

Screen Play has signed up nine freelance programmers so

far to produce material and the first titles are scheduled for the end of November.

To begin with Dave plans four BBC games, a menu-driven graphics/animation package for the Dragon and a Centipede game for the Commodore 64.



Of the new company he said: "Back a few months ago I was beginning to leap out of

Jump Label. Like Forth, Scope employs commands like building blocks using existing keywords to define further ones.

On the Spectrum, after the Scope compiler is loaded at Ram-top, a Scope program is written within Basic Rem statements. A completed program is then compiled in seconds using the Basic command *Print Usr 60450*.

To run a Scope machine-code program it is necessary first to load the Scope compiler.

ISP is a new company set up to develop the language. Founder and Scope author Allen Pendle says: "Scope means anybody can write in machine-code and the system does not suffer any of the limitations of menu-driven games writing programs."

Scope will be available for the 48K Spectrum from the beginning of November. It will come with a comprehensive manual, priced at £11.95. Details from ISP, Crown House, 38b High Street, Godalming, Surrey.

Big losses for Atari

MORE bad news from Atari. Last week the company reported further big losses.

A third quarter deficit of \$180.3m led to the parent company, Warner Communications, again showing an overall loss for the quarter of \$122.4m. Announcing the dismal news chairman Steven

tall buildings so I don't mind having to go back to square one and start again."

Dougie Bern declined to comment on the split: "Silversoft has been quiet for quite a while and now all I want to do is get it back on the right track."

As part of this plan Silversoft this week announced the release of four new titles for the 16K Spectrum, priced at £5.99: *Mission Impossible*, *Brain Damage*, *Armageddon*, and *Exterminator*.

Screen Play are at 134 St Vincent's Street, Glasgow G3. Silversoft are at 271-273 King Street, London W6.

Wargames comes true

THE computer crime plot of the hit film *Wargames* will not seem so far fetched after the real-life events of last week.

FBI agents raided the homes of more than a dozen teenage computer enthusiasts around the US last Wednesday following investigations into unauthorised intrusions into various national computer networks.

The investigation began in July after unauthorised accesses into the Telenet system linking some 1,200 commercial computers across the country were detected.

FBI officials said last Thursday that the teenage computer buffs — in New York, Los Angeles, Detroit and Oklahoma — are believed to have caused damage estimated at thousands of dollars to computer systems by changing or deleting information.

Worryingly, among the systems reported to be involved are computers at MIT, the nuclear laboratories at Los Alamos, and at the McClellan Air Force base in California.

Ross place part of the blame on a US price war precipitated by distressed companies selling off product cheaply in order to leave the business.

● Acorn offered its shares on the Unlisted Securities Market for the first time last week.

At no time on the first day did the shares reach their expected price of 120p. They dipped first to 118p and then to 108p

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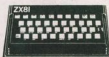
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Manic Miner...1

On trying *Manic Miner* with the Kempston joystick, I was startled to discover that *Manic Willy* could be controlled with the usual left-right control and fire as jump.

I was surprised because the packaging mentions nothing about the program being Kempston compatible — surely a fact that could only increase sales?

David Atter
Braeside
Killichonan
Rannoch Stn
Perthshire PH17 2QW

Just a nibble

I have been pondering over a question I found in a computer magazine but I am unable to find the answer in any of my books. The question is what do you call a group of four bits or half a byte? I am going mad over it, so could you send me the answer or print it in your magazine.

M B Sharp
32 Duddingston Drive
Kirkcaldy
Fife
Scotland KY2 6JP

The solution is simple. Half a byte is a nibble.

Disc drive problems

Two weeks ago, I purchased a Dragon Data disc drive. Since then, I have encountered several interesting features which may be of interest to you. Most of them are omissions from the provisional manual provided with the drive.

1) Use of ' and ' as separators.

The manual only describes the use of ' for separating multiple variables of strings in *Fwrite* statements. The separators act in the same way as separators in *Print* statements. So, if one were to execute *Fwrite "File":AS,BS,CS* then *AS* and *BS* will each be loaded on to the disc, followed by a number of space

characters to make the string length up to 16. This will not happen with *CS* since it is followed by an end of line terminator.

If this formatting is not required, a ' separator can be used: *Fwrite "File":AS,BS,C*. This can be similarly applied to *Fwrite "File":AS, "BS, ", "CS*.

2) *Eof* function.

The correct format for this function is: *Eof("File.XXX")* and not *Eof("File")* as in the manual.

3) *Dir* to a printer.

The *Dir* list can be printed on a printer by executing: *Poke111,245:Dir*.

4) Run function.

The Run function seems to work with machine code programs. This is not obvious from reading the manual.

5) Number of open files.

The manual states that 10 files can be open simultaneously. It seems that this means 5 write files and 5 read files can be open, ie, you cannot open 6 write files.

6) Initialisation sequence.

The disc controller is sensitive to the way the system is powered up and the disc is inserted. If the Dragon is switched on with the disc drive off or no disc inserted, and a disc is subsequently inserted, it cannot be accessed, an SK error being printed whenever an access is attempted. The reset button must be operated before accesses will work.

From prior experience, I am always worried about corrupting discs when powering up. The best sequence on the Dragon would appear to be: (a) power up the drive; (b) insert the disc, and (c) power up the Dragon.

7) Electrical problems.

There are two: firstly, whenever the drive motor is running, a patterning appears on the tv screen. This only affects the Dragon, and not ordinary stations. The drive is standing about 12ins from the Dragon. Secondly, I suspect that the Dragon's power supply is overloaded by the additional disc controller load as it gets very much hotter, and the sound generator is prone to crackling, possibly indicating low voltage.

I would welcome any comments or suggestions on the electrical problems, or indeed

any of the other points.

J A Niblock
Ardennes
7 Kingsley Crescent
Bulkington
Nuneaton
Warks CV12 9PL

Manic Miner...2

I thought I'd let you know of my highest score on *Manic Miner*. It stands at 101,731 — that's twice through and up the warehouse. It's the best game for the Spectrum I think and has given me hours of enjoyment.

David Acklan
44 Pinfold Street
Howden
Goole
Humberside

Not the champion

In reply to Julian Courtland-Smith (*PCW*, 29 September-5 October), I think I would be capable of emulating his friend's achievement of scoring 169,990. I read his letter of his friend's ability to play *Frogger* successfully and it made me realise that if it were not for the bugs in either our computer or the tape of *Frogger*, I would stand a chance of beating my top score of 25,790.

Every time I am doing well I

lose a life for no apparent reason. But sometimes an error appears and I can do nothing but turn off and load it again. I don't think David is world champion.

Elizabeth Meineck
41 Church Lane
Leeds LS15 8BB

Amended files

In the issue 6-12 October, there is a potentially frustrating error in the formulating for writing to and reading from tape files program for the Commodore 64.

Line 3100 should be amended to read: *3100 Close 1: Return* and similarly line 4120 should be amended: *4120 Close 1: Return*. Without these amendments, the saved data will be incomplete and reloading will prove impossible.

In addition, it should be noted that each data field; ie, name, address, etc, must have a response — without a response, a null character is entered and subsequent records will 'fall' into these null fields corrupting the whole data base.

Peter Gibbs
14 Beacon Way
Heath Hayes
Cannock
Staffs

A spider in the works

While inspecting the leads to my Spectrum this morning, I discovered a cobweb stretched over the mic, ear and power leads. Slightly puzzled, I removed the web and, on further inspection, discovered a medium sized spider had crawled into the I/O port at the back and had extended its web to cover most of what I could see of the inside of my computer.

Not wishing to invalidate my guarantee by opening the case, I am somewhat at a loss as to what to do next. I am sure that the spider cannot survive for too long inside the case (unless it can get at the bugs in the Rom), but could it cause any serious damage to the opponents or cause a short circuit

with its webbing if I switch the computer on? Am I justified in returning the computer because it is not spider-proof?

CR Mart
Rannmoor House
Shore Lane
Sheffield S10 3AY

Resisting the temptation to utter phrases such as 'fly in the ointment' and 'sticky situation', I can only say that this is a new one to me. Perhaps the spider was attracted by the residual heat inside the Spectrum after you switched it off?

In any event, while Sinclair is to blame for the 'Rom bugs', I don't think you can really blame them for not making the Spectrum spider-proof.

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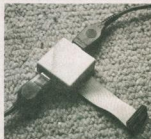
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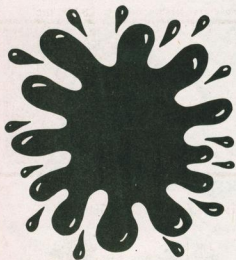
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Icarus

A new game for unexpanded Vic20 by H Rivera

You are soaring high above the deep blue sea, with your wings made from goose feathers and wax, when you see a feather fall in front of you. Being curious, you look up into the sky only to be shocked

by the sight of your son flying so close to the sun that the wax holding his feathers to his arms is beginning to melt.

Your task is to save your son, by catching the feathers and fixing them to his

arms again.

Part one of the program sets up the hi-res definable graphics and contains the instructions, while part two consists of the game itself.



Part 1

[illegible]

Part 2

```

1 CLR:EN=1000 I1=36874 :S2=36875 :S3=36876 :V1
2 =36878 :POKEV1,15 :POKE649,1 :POKE36863240
3 :DATA,-18,-41,-42,-55,-66,-67,-46,-47,
4 :26,-4
5 PRINT"*****PRESS ANY KEY"
6 GET$:IF$="" THEN4
7 :POKE36869,255 :PRINT"J" :POKE36879,235 :
8 T=680 C=38400 DEFNAC(X)=X-T+C
9
10 L=3 :GOSUB100
11 FORA=3950585 :POKEA+1,14 :POKEA+C,6 NEXT
12 A
13 GOT0499
14
15
16
17
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22
23
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```

```

100 IFL=-1:ENDI=1
110 ONL+IGOTO115,120,130,140
115 PRINT"#####SUV" RETURN
120 PRINT"#####STR" RETURN
130 PRINT"#####SOR" RETURN
140 PRINT"#####FOR" RETURN
149 REM FEATHER FALL
150 F=RND(1)*3+T*52:D=RND(1)*1.5+21.3:FE=1
  L=L-1:GOSUB100
160 POKEF,32:F=F+D:POKEF,9:POKEFNA(F),0:
  EN=EN-2
170 IFEN<0:POKEF(F+22)=-14THENFE=0:POKEF,22:
  GOSUB100
180 GOSUB600
190 IFPEEK(F)=8THENCA=1
195 RETURN
199 REM FLY FISH
200 S=RND(1)*10+T*6+22*17:P=0:FI=1
210 POKES+P,32:READP:POKES+P,10:EN=EN-4:
  POKEFNA(S+P),1
220 IFP=-4THENPOKES+P,32:RESTORE:FI=0
223 GOSUB600
225 IFPEEK(S+P)=8THENGOSUB700:FI=0:RESTORE
230 GOSUB600:RETURN
499 Z=T+10+22*10
500 K=PEEK(197):KE=(K=17)*22-(K=33)*22-
  (K=54)+(K=14)
505 BB=PEEK(KE+2):IFBB=140RZ+KECT+440RBB:
  15ANDBB<23THEN550
510 POKEZ,32:Z=Z+KE:POKEFNA(Z),4:POKEZ,8:
  PRINT"8";EN"II #####"SC"II"
520 IFEN<0THEN900
550 IFFI<0LANDRND(1),.9THENGOSUB200:GOTO565
560 IFFI=1THENGOSUB210
565 IFDI=10RL=-1THEN900
570 IFFI<0LANDRND(1),.9THENGOSUB150:GOTO585
580 IFFE=1THENGOSUB160
585 IFCA=1THEN800
590 GOTO500
600 K=PEEK(197):KE=(K=17)*22-(K=33)*22-
  (K=54)+(K=14):EN=EN-1
602 PRINT"8";EN" "
605 BB=PEEK(KE+2):IFBB=140RZ+KECT+440RBB:
  15ANDBB<23THEN630
610 POKEZ,32:Z=Z+KE:POKEFNA(Z),4:POKEZ,8
630 RETURN
700 POKES+P,11:POKES2,130:FORA=0TO20:POKES1,
  A+200:NEXT:POKES1,0:POKES2,0:POKES+P,32
  EN=EN+800:RETURN
710 FORA=0TO100:POKES1,A+100:NEXT:POKES1,0
710 IFPEEK(F+1)=14THENPOKEF,14:POKEFNA(F),
  6:GOTO815
812 POKEF,32
815 F=Z+44:POKEF,9:POKEFNA(F),0
820 GOSUB600:IFPEEK(Z-22)>15ANDPEEK(Z-22)
  <23THENL=L+1:GOSUB100:CA=0:SC=SC+15:GO
  TO840
830 GOTO810
840 POKEZ,32:FE=0:POKEF,32:GOTO499
900 POKET+31,32:POKET+32,32:POKET+33,
  32:POKEF,32
910 FORA=T+32TOT+32+22*15STEP22:POKEA,12:
  POKER+22,13:POKER-22,32
920 FORB=0TO50:NEXTB:NEXTA:POKEA-22,
  32:POKEA,5:POKEA-1,4:POKEA+1,6
925 POKEFNA(A),6:POKEFNA(A+1),6:POKEFNA
  (A-1),6
930 POKE36877,200:FORB=15TO0STEP-1,0:POKEV1,
  B:NEXT:POKE36877,0:POKE36869,240
935 POKER,32:POKEA+1,32:POKEA-1,32:POKES+P,
  32:POKEZ,32
940 PRINT"#####YOUR SCORE WAS";SC:PRINT"
  #####YOU WANT ANOTHER?"GO?":GETA#
950 GETA# IFA#=""THEN950
960 IFA#="Y"THENRND
970 PRINT"Z":POKE36879,27

```


An enterprising move

David Kelly talks to Robert Madge, technical director of Elan computers

The climate for the launching of new microcomputers has changed quite dramatically over the last six months.

Particularly in the United States, the weather could now be said to be decidedly chilly. At least, Atari, Texas and Mattel would appear to be finding it so.

Yet the Elan Enterprise, from a new UK company, is attempting to break into the home computer market, despite the reverses suffered by these companies. Due to be launched in April 1984, the Enterprise 64K and 128K will cost £199.95 and £299.95, respectively.

What is so special about the Elan Enterprise that will make it compete with the likes of Commodore and Sinclair?

Elan's Robert Madge is confident. He believes the Elan offers the best features from every micro, rolled into one machine.

It can display up to 16 colours at one time from a palette of 256 colours. It has 8-octave, four-voice, stereo sound, a full travel keyboard, built-in word processing software processor and built-in joystick. It can handle a 64K Rom cartridge.

The Enterprise has twin cassette ports, twin joystick ports, Centronics and RS232 interfaces. Add-on 64K memory expansion units and twin Sony microfloppy disc drives are options.

In short, Robert reckons the Enterprise is everyone's ideal computer.

The machine has been designed for Elan by Intelligent Software an established development house of which Robert is also a director.

"What we were asked to do in our brief was to design a computer which would be among the top few sellers, which would appeal on a whole number of levels — for games, for home business, for enthusiasts and novices and also appeal to commercial software houses who will have to produce material for it if it is to be a success."

A complete product

Intelligent has been a successful hardware and software development house since 1981, designing for such companies as Milton Bradley, Sinclair, Tandy, Dragon and Parker Bros. "We normally give a client a complete product — developed to the point where it can be taken into production," says Robert.

Work on the Elan project began a little over a year ago. One of Intelligent's strengths has always been to write software which exploits the hardware to the full and the Elan has been developed from "tip to toe" as a complete new design. Robert: "It is an approach with considerable advantages and some disadvantages."

"It makes us competitive. Most computer manufacturers do not have the experi-

tise to design a computer from scratch — particularly the software. It is a weakness of the Japanese and Hong Kong companies. There are many examples in the computer market at the moment — Mattel, Sharp, Dragon.

"Nearly all the Japanese system software is bought in from companies like Microsoft."

This was one option Intelligent could have taken. "It is well proven — people know what to expect from it. But, we would have had much less freedom to tailor the Basic to the machine. Microsoft showed no interest in engaging in modifications — they just wanted to hand over a complete package."

"Another problem is that there are many features lacking in Microsoft Basic — the world of programming has moved on. For example, there is very little support for structured programming."

Written from scratch

"Yet we had to have Basic in a very good and enhanced form, with particularly strong graphics and sound — these are the starting point for all independent companies to produce software for it."

The other problem with an off-the-shelf Basic was flexibility. "We had to make sure that, with the Basic and operating system software, we hadn't closed the door on any future developments. We are not crystal-ball gazers. Who knows what may wish to be connected to a computer in the future?"

So, Elan decided to write its own software from scratch, using the Basic outline recently proposed by the American National Standards Institute (ANSI).

"We wanted a Basic which was likely to be accepted as the standard programming language of the future — a version which would answer most of the objections people make to Basic."

"In the Elan I think we have achieved that." The total Rom used in the Elan is 32K — including the Basic, Elan's own Eros in-built operating system and word processor.

The Basic has all the normal block-programming features — Do loops with tests for *While* and *Until*. Functions and expressions can be defined as procedures which can be called from within a program.

One of the more interesting commands is *Set*. It allows various machine options to be set — *Set video mode* determines the graphics mode. *Set Byte* and *Ask Byte* are the Elan equivalent of *Poke* and *Peek*. *Set Pixel Size*. *Set Character Size*.

The Elan has *If* and *Else/If* blocks. The *Picture* function allows a group of graphics statements to be defined and then called from within a program. *Music* does much the same for sound statements. Elan Basic



has *Plot*, *Fill*, *Circle*, *Oval*, *Paint*. The machine has a number of pre-defined sound commands — as well as *Play*, *Pitch* and *Volume*: *Bang*, *Beep*, *Boom*, *Ping*, *Pop*, *Splat* and *Zap*.

You can change the functions of any keyword. Functions can be defined in Basic and then called. There is also a set instruction to go into the operating system — additional Basic commands can be added in machine-code, loaded in from cassette or disc.

The operating system is designed so that when a new peripheral is added — say discs — new commands held in Rom-based code in the new add-on are automatically patched into the existing Basic as additional commands.

The video controller is extremely flexible. Under machine-code control, you can split the screen up any way you like — any number of horizontal bands and you can have as many modes of display as there are mode lines: 256.

From Basic you can define 16K video pages — up to 256 within the limit of the available Ram. Then it is possible to display at the same time on screen any of those pages by defining display "windows".

The Elan offers, as graphics options, 16 modes of which 8 are non-interlaced. These are, for text: 42 columns x 28 rows with 1, 2 or 4 colour-pairs and 84 columns x 28 rows with 1 or 4 colour-pairs. And for graphics: 336 pixels by 256 lines using only two colours or using all 16 colours and 672 pixels x 256 lines using two colours.

Each mode is a trade-off of pixel and colour resolution against speed and Ram used — ranging from 2.2K to 24.3K per screen (rough figures).

The Elan is Z80 based for two reasons: it is CP/M compatible and because, by chance, one of the display modes on the Elan closely emulates that on the Sinclair Spectrum. Says Robert: "There is an awful lot of fundamental software written for the Z80. Also we couldn't have got such a versatile screen display using, for example, a 6502. Also, with the Z80 you can extend the address space in 64K blocks all the way up to 4M."

"Again," says Robert, "with the whole design of the Elan we have not tried to produce something fundamentally new. Just better. With all the good features from other machines taken and developed as far as possible."

Along the cakewalk

Andrew Pennell runs the gamut of another selection of Spectrum software

The amount of Spectrum software on the market is already huge, and growing all the time. Several new companies are appearing and some are very promising indeed, though a few of the more well-known companies appear to be slipping under the competition.

Super Digger from Abacus comes with very fancy packaging, describing the game as "entertaining for all the family". The plot is familiar — you are a man in a system of floors, separated by ladders, populated with several man-eating monsters. Armed only with a pick-axe, you have to dig holes, and when a monsters falls into them, go and hit it over the head.

A plot such as this can be excitingly implemented on the Spectrum — it forms part of the *Horace & the Spiders* game, which shows just what can be done with it. However, *Super Digger* is not a very inspired version at all — the graphics and sound are both fairly rudimentary.

It is now becoming the norm for games to feature sprite-type graphics — that is, each object is not restricted to the 8 x 8 pixel character squares. This allows large shapes to move smoothly and realistically. But, *Super Digger* uses small, crude character-sized monsters, which are none too exciting and move very jerkily. When you finish a screen, instead of getting a diffe-

rent arrangement of floors and ladders you get the same one again, with one more monster. The controls to move the man are restricted to the cursor keys, with no provision for a joystick.

On the reverse side of the tape is what Abacus describe as a "Free B side bonus", a game called *Chase*. It is a version of the arcade game, where you must avoid another car travelling in the opposite direction around concentric squares, and is not very exciting.

Bedlam is a game from a company new to me, called AWA Software. You are a spaceship in a criss-cross network of corridors, which has a large number of other, rather unfriendly, inhabitants. You must move around the screen and shoot them all, before they catch you and, on the higher levels, fire back at you.

The creatures themselves are colourful and very varied, though a little on the small side. They move quickly and smoothly, speeding up as you kill more of their associates. Occasionally white saucers appear, and they move extremely quickly, firing at you as they go. If you kill 10 of them (which is almost impossible), you get a bonus life.

A pathway through space

To control your man, five keys are used — four for the direction, and one to fire, and you can choose them yourself. Again, no joystick option is offered.

The only real problem with *Bedlam* is that to move your ship in another direction you must press the relevant key twice — once to rotate it, and the second time to actually move it. This is a big disadvantage, especially if a creature is close on your heels, because you can't turn corners quickly. The other problem that I found is that the volume is very critical as you *Load* it, because there is a non-standard tone recorded at the end. It took a good deal of fiddling to eventually find the right level.

Bedlam is a very good program from a new company, with good graphics and sound, but it's a bit awkward to control.

Triplex, by Workforce, is a game consisting of three very different sections,

hence the name. In all three sections you are a green space ship with a gun, which you control using some very well chosen keys, though there is no joystick option.

The first section is a variant of *Asteroids* — several large moons move around the screen, and you have to avoid hitting them while shooting at them. To destroy each

moon, you must hit it 15 times — it gradually changes colour the more you hit it. On a black and white television though, it is very difficult to determine just how much you have damaged each moon.

When you finish the first section your score so far is given, based on the number of shots taken, and you progress on to the second part. In this section you must cross a curiously named cakewalk, which is a pathway through space. Each side of the cakewalk are scrolling star clusters and several weird objects. You must avoid them, shooting whenever possible, as well as avoiding the stars.

If you manage to complete the cakewalk, you go to the third screen, which is a sort of sideways *Space Invaders*, in which you must destroy each ship in turn as it comes for you. It is rather unfair that they fire about four fast missiles at you, when you can only reply with one feeble missile.

Although the graphics in *Triplex* are superb, the game is not very addictive and has a couple of flaws. One is that the machine will reset on the ground screen if a joystick is connected, and that the number of lives you have left is never displayed. On screen two, you often get killed for no apparent reason, and there is a serious bug that removes all your remaining lives if you collide with the bird at the far left position. *Triplex* shows that, however brilliant the graphics, they cannot compensate for a poor plot.

Last Sunset for Lattica, from Arcade Software, is a type of *Beserk* game, but on a larger scale. You are in a big maze of old buildings which contains no less than 600 creatures, all of which seem to have a grudge against you. You must negotiate the maze, while avoiding the missiles, and gaining points by shooting the aliens. You die if you touch the edges of any passage, but spread sparsely around the place are life potions, which give you bonus lives.

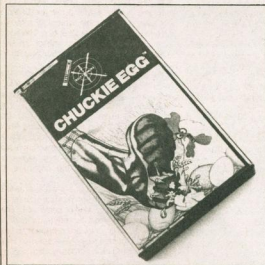
When you move your man to the edge of the current screen, it is cleared and a new one printed. It would be better if it scrolled as you moved, as there are some places where the screen kept switching between two different displays.

The graphics are neat and very colourful. The controls to move are the cursor keys, or joystick.

The idea is to find keys in the maze, which will transport you to the next level. When you reach the third level, you can defuse a bomb that threatens to destroy the whole planet — hence the name. However, the only evidence of the keys that I could find in the game was in the opening titles — I never found a single key or lock at all, though I feel sure they must be there somewhere.

Last Sunset for Lattica has a good plot and graphics, but I think the element of luck is a little too great.

Dungeon Master, from Crystal Computing is a role-playing adventure game in true *Dungeon & Dragon* tradition. It is not a computer adventure in the normal sense of



rent arrangement of floors and ladders you get the same one again, with one more monster. The controls to move the man are restricted to the cursor keys, with no provision for a joystick.

On the reverse side of the tape is what Abacus describe as a "Free B side bonus", a game called *Chase*. It is a

the word, as it has a much higher bias on combat, instead of the more usual emphasis on solving puzzles. Your character is assigned initial values of strength, dexterity, etc, though these can change through the game, depending on what happens.

You begin in an underground network of rooms. The aim is to find a number of turquoise rings spread around them. In most rooms there are objects of some kind or other — either spells for fighting magical monsters or weapons for non-magical types. Every room that I got to (which wasn't very many) has at least one monster in it, which made progress rather difficult.

Repertoire of funeral marches

Commands are entered via a machine-code routine which seems very slow — it was annoying that I could easily type much faster than the program could accept. A faster routine could be written in Basic.

Most of the normal options are available, such as *Open* and *Drop*, though some have non-standard names, such as *Keep* (for *Get*). When you meet a monster, you have the chance to run away, or stay and fight with a weapon or a spell.

Once you have chosen your weapon, the fight itself is out of your control. The programs print a running commentary of the combat, blow by blow, but you do nothing but sit back and watch. Some of the fights stopped suddenly for no apparent reason, while others went on too long, as you cannot stop it yourself.

The program has a good repertoire of funeral marches which are played when you kill a monster, and when you die yourself, which is a nice touch. A disadvantage of the program's structure is

that when you get killed you have to rewind the tape and reload the data to play again.

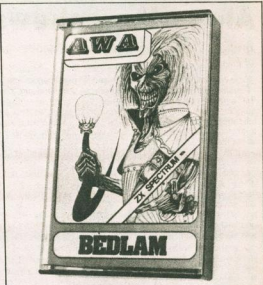
One thing that makes this program very different is that you can make up your own dungeons, using the *Creator* program supplied on the reverse side of the tape. You can set the geometry of it, and its exact contents, fairly easily.

The best of the bunch is without doubt *Chuckie Egg*, by A&F Software. It is destined to become an all time Spectrum classic. You must collect the eggs from each network of floors, ladders and lifts, while avoiding the vicious hens who patrol the whole area.

To obtain bonus points, you must collect the small packets of bird seed before the hens eat them.

The graphics are brilliant, of Ultimate quality, and the sound is excellent too. The only quibble I have is that the colours go a bit wrong when a moving object is on a ladder.

To control your man, you have the choice of two fixed sets of keys, or you can choose your own. No joystick provision is included, so after a while I modified it myself (this is not to be recommended to the majority of Spectrum owners, as it is far from straightforward). As far as I know, this is the only game that up to four players



can play, and all the scores are shown on the screen simultaneously.

The game is extremely compulsive, and after many hours of playing I only got to level seven. For those that can go further than this, the large hen, who is in a cage at the top of the screen, apparently comes out and chases you, making it even harder.

Chuckie Egg is bound to be compared with the superlative *Manic Miner* from Bug-Byte. I think *Manic Miner* just beats it, because of the huge variety of different screens, and the joystick option. However, *Chuckie Egg* is definitely one of the best Spectrum games, and another reason for 16K owners to upgrade.

As one of the privileged few who have Microdrives, and a couple of Interface 1s, I found that there is a lot of software that is almost incompatible with them. I say almost, because you must reset the machine prior to *Loading it*, by doing *Rand Usr 0* or similar. The incompatibility is caused by programs having machine code in Rem statements, as they move in memory, and most of the programs I reviewed here suffered.

While so much new software is being released, potential purchasers should be very wary of the quality of some of it. But, Ultimate have raised the required standard and some companies are responding, like A&F with *Chuckie Egg*. AWA seem to be a very promising new company, with a good product like *Bedlam*.

I only wish more companies would offer joystick options on their games — it is a real hassle to break into them and modify them yourself, when you consider how easy it is for the authors to include it. This sample is also representative of the fact that more and more quality software requires 48K to run it in.

Firm	Program	Memory	Cost	Value (1-10)
A & F Software 630 Hyde Road Manchester M18 7JD	<i>Chuckie Egg</i>	48K	£6.95	9
AWA Software 50 Dundonald Road Manchester M20 0RU	<i>Bedlam</i>	16K	£5.95	8
Arcade Software Technology House 32 Chiselmurst Road Orpington Kent BR6 0DG	<i>Last Sunset for Lattica</i>	48K	£5.50	7
Crystal Computing 2 Ashton Way East Herrington Sunderland SR3 3RX	<i>Dungeon Master</i>	48K	£7.50	7
Workforce 140 Wilsden Avenue Luton Bedfordshire	<i>Triplex</i>	48K	£5.95	6
Abacus Programs 716 Llangyfelach Road Treboeth Swansea SA5 9EL	<i>Super Digger</i>	16K	£4.95	3

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VIC 20

GAMES AND UTILITIES

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KWAZY KWAKS

Accuracy and speed are required for this Shooting Gallery, superb use of colour and graphics in this new and challenging game from the author of **Jackpot**. 100% machine code, joystick or keyboard control .. **£5.50**

PACMANIA

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GAMES AND UTILITIES

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A step in the right direction

Noel Williams reflects on the usefulness of flowcharts in constructing programs

To design an efficient program for solving a problem or carrying out an operation, you first have to describe every stage of that problem or process precisely, and state all the means by which those stages interconnect. A flowchart is one of the handiest and most common ways of doing this.

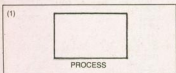
Basically, a flowchart is a series of boxes representing the various elements of your program, and a series of arrows representing the relationships between those elements. Computer flowcharts use a set of conventional symbols for the boxes, though not all the conventions are universally accepted.

Each type of box can be drawn freehand, but it is easier to use a specially designed template. These can be bought from stationers, computer supply shops and drawing supply shops. They can be as expensive as £4.50, but you don't need to spend this much unless you want to get perfect graphic results, which is pointless for most purposes. The cheapest template I've seen is 75p and perfectly adequate.

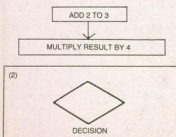
You need two kinds of knowledge to draw useful flowcharts. Firstly, you need to know what the different signs mean and how to use them and, secondly, you need to know how to turn your vague and imprecise ideas into the specific language of the flowchart.

Flowchart conventions

I'll simply list here the most commonly used signs with a brief explanation, then I'll give some hints on how to use them. A program is essentially a series of processes.

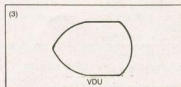
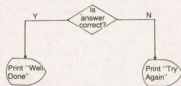


Thus, the simplest flowchart will just be a series of boxes arranged in the proper order, such as:

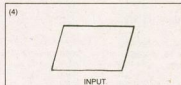


Most flowchart boxes only have one

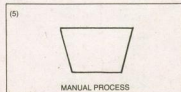
arrow coming out of them, but the decision box has at least two, representing the Yes and No answers to a particular question, usually made in Basic by *If - Then* statements. So, if you wanted your program to print "Well done" in response to a correct answer, your flowchart might look like this:



The most common output is displayed on VDU, so there's a box for that. Other forms of output have different representations. There's also a box for input. Different forms of input also have different representations.



Although a program is all run by computer, that program might be part of a larger system, such as a business system, which also has manual operations, eg, consulting a ledger, taking printout to a particular file, etc.



Many flowcharts cannot be confined to a single page. So that you can follow the logic from one page to another, connectors are used with a letter inside, the letter

being the same on both the connected pages.



There are at least nine other signs you can use. My advice is to buy a template which names each box, such as the one available from WH Smith.

Flowcharts help you clarify your ideas and provide a useful intermediate stage between having an idea and writing the program. They provide good guidelines during encoding and can be used for reference to assist in debugging.

It is important, therefore, to make sure that every stage of your idea is in the flowchart. The best way, particularly if the program is likely to be long, is to work on a simple overall chart first as a basic plan which fixes all the major stages, then take each of those stages in turn and work out its own detailed flowchart involving every minor element. Each of these smaller charts will end in connectors. When you've done all of the stages, all the connectors will join up. Such an approach encourages good structured, modular, programming.

A useful preliminary to writing a flowchart is to sketch in prose the main aspect of your intended program. Writing the flowchart then becomes a question of deciding how to do something, rather than deciding what to do.

Remember to draw in the loops in your flowchart, and check also that every box has at least one arrow going into it and one coming out (unless, of course, it is the *Start* or *End* box). Also, break down decisions into a series of the simplest possible binary operations, rather than a single complex decision which has more than two possible outcomes.

Leave plenty of space around and between your boxes. Almost certainly, as your flowchart develops, you'll think of extra stages to insert or feedback loops that have to be drawn in, so you'll be cursing if there's no room to draw them. A cluttered flowchart defeats its object. It is meant to clarify, so it has to be clear.

Using flowcharts also makes it easier to translate programs from one language to another, or from one dialect of Basic to another. So it is worth keeping your flowcharts in case you ever change to a different system, and as starting places for future program design.



A routine matter

Peter Whittaker explains how to call Rom routines from within machine code programs

As a newcomer to machine code programming, I have frequently been overawed by the complexity of the programs I would have to write to obtain even simple results.

For example, the Dragon Basic command *Circle(X,Y),R,C* is very easy to use, but very difficult to copy in machine code. The *Get* and *Put* commands may be more simple, but still require a great deal of time and thought.

Surely it should be possible to *Execute* the Dragon's *Circle* routine in the Rom, rather than having to write your own routine? In fact, some of the routines can be *Executed* directly with no problems. For example, *Run: Exec34213* and *Cload: Exec46804*.

For the other routines, we need to be rather more devious. The technique is to fool the computer into *Running* a Basic line in the middle of a machine code program. This is achieved in seven steps:

- (1) Create a Tokenised Basic line as a data table in your machine code. Listing 1 will give the tokens for the Basic commands and their *Exec* addresses in the Rom. If any difficulty is experienced in tokenising a line, enter it as line 10 in listing 3, which will tokenise it for you. All Basic lines must end with a 0 (zero), eg: *@dim Fcb 140,65,40,49,48,44,49,48,41,0*.
- (2) Save the Pointer at &Ha6. This is used by the Basic Interpreter to keep track of its position in a Basic line or a direct statement, ie: *Ldx<±A6:Pshs X*.

(3) Point the X register to the start of your Basic line, ie: *LeaX @dim,Pcr*.

(4) Load the A register with the first character of that line, ie: *LDA X*.

(5) Clear the condition code register to signal the Interpreter that the following command is to be executed, and not stored as a new program line, ie: *Andcc #&FE*.

(6) Execute the Rom routine, eg: *Jsr 35467*.

(7) Restore the Pointer at &Ha6, ie: *Puls X:Stx >A6*.

Listing 2 demonstrates the use of the *Dim*, *Draw*, *Get*, *Put* and *Play* commands. Once the machine code has been entered (either from the hex dump or the assembler listing) enter the following program, and Run it:

10 PMODE 4,1:PCLES:SCREEN1,0:EXEC

This will prevent the occurrence of a *DD Error* when the machine code tries to redimension the array on subsequent *Executions*. The program is stopped by moving the right joystick to the right. ■

LISTING 1

```
10 PRINT#-2,CHR$(13)
20 PRINT#-2,"TOKEN";TAB(20);"BASIC";TAB(40);"EXEC ADDRESS";PRINT#-2,CHR$(13)
30 A=127:B=32818:C=33189:D=144205
40 A=A+1:IF A>D THEN ENDELSEPRINT#-2,A;TAB(20);" "
50 B=B+1:IF PEEK(B)<128 THEN PRINT#-2,CHR$(PEEK(B));GOTO50ELSEPRINT#-2,CHR$(PEEK(B)-128)
60 E=PEEK(C)*256+PEEK(C+1):C=C+2:PRINT#-2,TAB(40);E:GOTO40
```

RUN

TOKEN	BASIC	EXEC ADDRESS	TOKEN	BASIC	EXEC ADDRESS
128	FOR	33864	167	EDIT	39269
129	GO	34233	168	TRON	39641
130	REM	34326	169	TROFF	39642
131		34326	170	LINE	42825
132	ELSE	34326	171	PCLS	43200
133	IF	34375	172	PSET	42735
134	DATA	34323	173	PRESET	42739
135	PRINT	36925	174	SCREEN	43518
136	ON	34421	175	PCLARR	43545
137	INPUT	34603	176	COLOR	43220
138	END	34096	177	CIRCLE	45624
139	NEXT	34857	178	PRINT	44167
140	DIM	35467	179	GET	43760
141	READ	34679	180	PUT	43763
142	LET	34492	181	DRAW	45137
143	RUN	34213	182	PCOPY	43710
144	RESTORE	34068	183	PMODE	43439
145	RETURN	34291	184	PLAY	44477
146	STOP	34105	185	DLOAD	41033
147	POKE	36509	186	RENUM	40442
148	CONT	34144	187	TAB	21319
149	LIST	36522	188	TO	52809
150	CLEAR	34161	189	SUB	20180
151	NEW	33813	190	FN	16706
152	DEF	40065	191	THEN	54096
153	CLOAD	46904	192	NOT	20435
154	CSAVE	46722	193	STEP	21070
155	OPEN	47144	194	OFF	50259
156	CLOSE	46668	195	+	20946
157	LLIST	36516	196	-	19535
158	SET	47570	197	*	51013
159	RESET	47619	198	/	22736
160	CLS	47711	199	^	21321
161	MOTOR	47489	200	AND	52803
162	SOUND	47770	201	OR	20435
163	AUDIO	47839	202	>	21569
164	EXEC	46960	203	=	52801
165	SKIPF	47134	204	<	21710
166	DEL	40289	205	USING	20549



LISTING 2

```

7531
7531 9EAE
7533 3410
7535 8E8B8B
7538 BF75C7
753B 388D089F
753B 8D7F
7541 8E8B51
7544 BF75C7
7547 388D089F
754B 8D73
754D 8E8B8B
7550 BF75C7
7553 388D089F
7557 8D67
7559 8E8B8B
755C BF75C7
755F 8E8B
7561 877634
7564 7C76E8
7567 7C7617
756A 8D47
756C 7A7634
756F 26F3
7571 8E8B
7573 877634
7576 7C7611
7579 7C761B
757C 8D35
757E 7A7634
7581 26F3
7583 8E8B
7585 877634

210 PRT
20 28TART LDX >#A5
20 PSHS X
20 LDX #35467
20 STX @ADDRESS
20 LEAX @DIM,PCF
20 BSR @BASIC
20 LDX #45137
20 STX @ADDRESS
20 LEAX @DRAH,PCF
20 BSR @BASIC
20 LDX #43768
20 STX @ADDRESS
20 LEAX @GET,PCF
20 BSR @BASIC
20 LDX #43763
20 STX @ADDRESS
40 @BEGIN LDR #8
40 STR @COUNT
40 @BLOP1 INC @X1
40 INC @X2
40 BSR @ACT
40 DEC @COUNT
40 BNE @BLOP1
50 LDR #8
50 STR @COUNT
50 @BLOP2 INC @Y1
50 INC @Y2
50 BSR @ACT
50 DEC @COUNT
50 BNE @BLOP2
60 LDR #8
60 STR @COUNT

7588 7A76E8
758B 7A7617
758E 8D23
7590 7A7634
7593 26F3
7595 8E8B
7597 877634
759A 7A7611
759D 7A761B
759F 8D11
75A2 7A7634
75A5 26F3
75A7 8E8B8B
75AA 817F
75AC 2CB1
75AE 3510
75B0 9FA6
75B2 39
75B3 388D089F
75B7 8D87
75B9 388D089F
75BD 8D8B
75BF 39
75C0 9FA6
75C2 8E8B
75C4 1CFE
75C6 8D1234
75C9 39
75CA 9FA6
75CC 8E8B
75CE 1CFE
75D0 8D8D8D
75D3 39

60 @BLOP3 DEC @X1
60 DEC @X2
60 BSR @ACT
60 DEC @COUNT
60 BNE @BLOP3
70 LDR #8
70 STR @COUNT
70 @BLOP4 DEC @Y1
70 DEC @Y2
70 BSR @ACT
70 DEC @COUNT
70 BNE @BLOP4
72 LDR 65288
72 CHRA #127
72 BGE @BEGIN
75 PULS X
75 STX >#A5
75 RTS
80 @ACT LEAX @PUT,PCF
80 BSR @BASIC
80 LEAX @PLAY,PCF
80 BSR @BASIC2
80 RTS
90 @BASIC STX >#A5
90 LDR ,X
90 ANDCC #8FE
90 JSR #1234
90 RTS
100 @BASIC2 STX >#A5
100 LDR ,X
100 ANDCC #8FE
100 JSR 44477
100 RTS

75D4 8C412831312C3131 130 @DIM FCB 140,65,48,49,49,44,49,49,41,8
75D6 8522424031352831 140 @DRAH FCB 181,34,66,77,49,53,44,49,53,78,85,52,78,
68,52,78,76,52,78,82,52,
75F5 832831302C313829 150 @GET FCB 179,40,49,48,44,49,48,41,196,40,50,48,44,
50,48,41,44,65,44,71,0
760A 84283132312C3931 160 @PUT FCB 180,40,49,50,49,44,57,49,41,196,40,49,51,
49,44,49,48,49,41,44,65,44,172,0
7622 88224C3235355431 170 @PLAY FCB 184,34,76,50,53,53,84,49,48,48,79,49,65,
68,66,71,34,0
760E 180 @X1 EQU @PUT+4
7617 180 @X2 EQU @PUT+13
7611 180 @Y1 EQU @PUT+7
761B 180 @Y2 EQU @PUT+17
7634 8000 190 @COUNT FCB 0
75C7 200 @ADDRESS EQU @BASIC+7
7636 210 END @START

```

Hex dump

```

7531 9E A6 34 10 8E 9A 9B BF 75 C7 30 8D 0 96 8D
7540 7F 8E 80 51 BF 75 C7 30 8D 0 94 8D 73 8E AA
754F F0 BF 75 C7 30 8D 0 9F 8D 67 8E AA F3 BF 75
755E C7 86 8 B7 76 34 7C 76 E 7C 76 17 8D 47 7A
756D 76 34 26 F3 86 8 B7 76 34 7C 76 11 7C 76 1B
757C 8D 35 7A 76 34 26 F3 86 8 B7 76 34 7A 76 E
758B 7A 76 17 8D 23 7A 76 34 26 F3 86 8 B7 76 34
759A 7A 76 11 7A 76 1B 8D 11 7A 76 34 26 F3 86 FF
75A9 0 81 7F 2C B1 35 10 9F A6 39 30 8D 0 54 8D
75B8 7 30 8D 0 66 8D 8 39 9F A6 A6 84 1C FE 8D
75C7 12 34 39 9F A6 A6 84 1C FE 8D AD BD 39 8C 41
75D6 28 31 31 2C 31 31 29 0 85 22 42 4D 31 35 2C
75E5 31 35 4E 55 34 4E 44 34 4E 4C 34 4E 52 34 22
75F4 0 B3 28 31 30 2C 31 30 29 C4 28 32 30 2C 32
7603 30 29 2C 41 2C 47 0 B4 28 31 32 31 2C 39 31
7612 29 C4 28 31 33 31 2C 31 30 31 29 2C 41 2C AC
7621 0 B8 22 4C 32 35 35 54 31 30 30 4F 31 41 44
7630 42 47 22 0 0 0 FF

```

LISTING 3

```

1 GOT028
10 DIMA(10,10)
20 A=PEEK(25)*256+PEEK(26)+12
30 A=A+1:PRINT#-2,PEEK(A);" ";;IF PEEK(A)<0 THEN 30 ELSE PRINT#-2,CHR$(13);END

```

RUN

```

140 65 40 49 48 44 49 48 41 0

```

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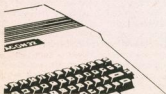
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The sound barrier

David Hoadley explains how to make your Spectrum simulate a VU meter

The sort of programs most commonly advertised for the Spectrum are games. This is not surprising, as, sad to say, people usually buy their Spectrum with games in mind.

Occasionally, however, some users manage to tear themselves away from blasting hideous alien hordes, and sit down and write a program of their own. So, one afternoon when the aliens had got the better of me yet again, I pulled the plug and, after some thought, came up with the basis of this program.

It is written for those with friends or relatives who, when shown your pride and joy, will say, "Very nice, dear, but what use is it?". One is usually confounded by this often-asked question, and this program, I hope, will serve as a good demonstration of just what a Spectrum is capable of, even if it is not a program you use every day.

The idea of the program is to turn your ZX Spectrum into something loosely resembling a VU meter. Amazing huh? Basically, what the program does is to identify on a scale of 0 to 255, the amplitude and frequency of sound coming in through the Spectrum's Ear socket. To use the program, you must simply connect the Ear socket on a sound source, to the Ear socket on your Spectrum.

It should be noted that the program will not work properly with a ZX printer connected — this causes a value of 255 to be Poked to the location where the value is stopped by the machine code, every time the machine code loops, thus making the display less than spectacular.

When you Run the program, you will see a box at the bottom of the screen, divided into two parts, with nothing much happening in them. In the upper part of the screen, you will see a line creeping across.

Now for the spectacular bit. Switch your sound source on and, voila! If nothing has happened after you do this, first of all check that there is some sort of noise going into your Spectrum. Then try adjusting the tone and volume until some effect is visible on the screen. If not, you're in trouble (I suggest you check the listing carefully).

For those of you who have something appearing on your tv screens, I will explain what is happening. The display in the top half of the screen provides a record of the last 255 values Poked from location 23608. As this fills the screen it will clear itself, and start again.

Now to the flashing bits at the bottom, in the box. The one to the left simulates the Led VU meter found on many hi-fis nowadays. You will notice that, as the value gets above 0 on the scale, the Led's will change to red. On the right, a small magenta block will light up if the value gets

high enough, showing that the music (or whatever) is particularly loud.

To make the program as fast as possible, I have used a short, 25 byte machine code routine, which reads the value at the Ear socket, and Pokes it to address 23608 — this may be familiar to those of you who have read Chapter 25 in the Spectrum manual. It is the address where, normally, the length of that annoying warning buzz is stored.

```
1 REM 1234567890123
4567890123456789012
34567890
2 INK 0: PAPER 7: C
LS
3 IF PEEK 23760<>33
THEN GO SUB 9000
4 LET b$=""
5 PRINT INK 7: PAPER
1: AT 0,0: "UU ME
TER © D.A.Hoadley, ..
1983
6 PLOT 0,30: DRAW 2
00,0: DRAW 0,-30: D
RAW 47,0: DRAW 0,30
: DRAW -47,0: PLOT
0,30: DRAW 0,-30:
DRAW 200,0
7 PRINT AT 19,1: "-2
0 -10 0 10
20:
8 PRINT AT 19,26: I
NK 0: PAPER 4: "PEAK
"
9 LET a$=""
10 FOR n=0 TO 255
20 LET t=USR 23760
21 LET a=PEEK 23608
22 INK 1
30 PLOT n,87
40 DRAW 0,13/4:
51 LET t=a/13
52 INK 0
60 PRINT INK 5: AT
20,1: a$( TO t)+b$!
TO (20-t)
61 PRINT AT 20,12:
OVER 1: PAPER 7: IN
K 2:
80 IF t>14 THEN PRI
NT AT 20,26: INK 3:
PAPER 7: "
61 FOR f=0 TO 3: NE
XT f
90 PRINT AT 20,26: "
```

```
200 NEXT n: RUN
9000 FOR f=23760 TO
25764
9005 READ a: POKE f
3 NEXT f
9010 DATA 33,56,92,
62,0,119,6,255,219,
250,254,255,40,1,52
,16,247,201,0,0,0,0
,0,0,0
9020 RETURN
```

The routine itself is Poked automatically by the program into a Rem statement at the beginning of the program (so don't miss it out to save those aching fingers). This should have more than 30 characters in it, to allow plenty of space for the machine code. This routine is relocatable, so for those of you who wish to avoid the adverse effect the machine code has on the listing (when listing, use List 2 to avoid this) you could easily POKe the machine code to somewhere else in memory. I prefer to keep my machine code routines in a Rem statement because it is easy to keep track of them. For anyone who is interested, these are the mnemonics for the machine code:

```
LD HL,(5C38)
LD A,00
LD (HL),A
LD B,FF
IN A,(FA)
CP FF
JR Z,01
INC (HL)
DJNZ -9
RET
NOP (X7)
```

This loops round 255 times and increments 23608 each time something comes in through the Ear socket — giving the final number at 23608 each time the routine is called from Basic by line 20. Here is a blow-by-blow account of which line does what:

- 1 REM where machine code is stored
- 3 Checks to see if machine code has been POKED. If not, it GOSUBs 9000.
- 5-8 Draw box, label it.
- 9 Assigns a\$, the string which is used in the LED simulator (20 character 5's).
- 10 Start loop.
- 20 Call machine code.
- 21 Let a = value returned at EAR socket, stored in 23608.
- 30-40 Plot and draw upper part of display.
- 51 Reduces PEEKed value.
- 60 Slices and prints a\$ according to value returned at 23608.
- 80 Prints bar if peak is reached (4 inverse graphic 3's).
- 81 Pause.
- 90 Print over bar.
- 200 Next part of loop: Start again.
- 9000-9020 POKES machine code to 23760 onwards.

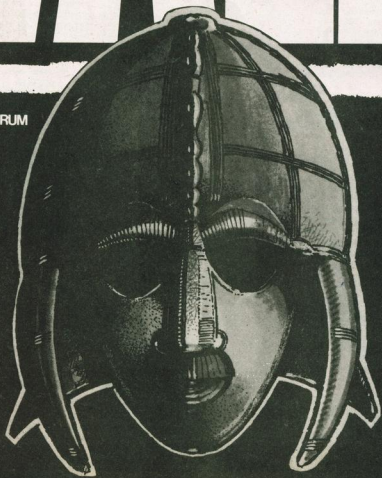
You could improve on this program in quite a few ways: How about a real dial to show the value, instead of the Led? You would use the same method used in the manual to produce the 'clock', or maybe a digital reading of the value printed somewhere or other.

If you wanted to be really ambitious, you could convert the whole program to machine code. This would improve its speed and accuracy a great deal, because as it stands, the program misses bits of music each time it prints up the Led and draws the top half of the screen.

The machine code routine could be incorporated into many different programs, which use sound analysis of some kind. A program could be written that would only respond to certain sounds coming in at the Ear socket for security reasons — there's an idea.

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Video, video

David King presents the second and final part of his computer captions for videos program

Last week we looked at two procedures with which we can easily calculate screen positioning in terms of *Print Tab* (X,Y). These are incorporated in listing 3, though lines 390, 490, 600 and 610 will need modification. Apart from one or two short procedures to aid the presentation and flow of the program, the main procedure is *Procsaver*, which is defined at lines 960-1410.

Programs are normally saved in a shortened form, with Basic commands stored as reduced tokens. The *Spool* command on the BBC Micro and Acorn Electron causes whatever next appears on the screen to be Saved on to cassette as Ascii characters. This means that if you Run the program in listing 1, line 20 activates the *Spool* command and what is printed on the screen by line 30 is stored for posterity on tape or disc as an Ascii file. Line 40 finishes the facility.

If we engage the *Spool* command and then print a syntactically correct program

on to the screen, that program is Saved on to cassette. Again the program is Saved as an Ascii file, so it cannot be reloaded with the *Load* or *Chain* commands. Listing 2 shows how variables can be passed into the Ascii program.

When the program has Run and the Ascii file has been recorded, type *New* (or the programs will merge), then *Load* the file by typing **Exec"Demo2" + <Return>* key. Ignore error messages and Run the program. The program can now be *Listed*, *Saved*, *Loaded* and Run as any Basic program. In line 80, *Print Chr\$34* has to be used to make quotation marks appear on the screen. The program uses easy variable names to aid typing. It will probably save time if you define the red keys to print them, eg: **Key2* key-pressed.

The principle behind listing 2, where we make a complete listing appear on-screen then record it, is extended in *Procsaver*. Lines 1010-1220 print the main body of the generated program on to the screen. Lines

1230-1290 display your data within the new program.

The program contains brief but helpful instructions, and operates as follows:

- (1) Position cursor to calculate vertical position.
- (2) Select double or single height for characters.
- (3) Type in line of text.
- (4) Do you want a reveal delay after this line of text?
- (5) Do you want the next page, same page or to exit this stage of the program?
- (6) Save the generated program on to cassette or disc.

If you have the 1.2 Rom fitted, you can insert teletext colour codes into the text by pressing Shift and a red key. However, you will get the clearest pictures if you use white lettering on black, using the "video out" socket on the computer connected to "video in" on the video recorder. ■

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Listing 1

```
10 REM first demo DK
20 *SPOOL"Demo1"
30 PRINT"Dudley College of Technology"
40 *SPOOL
50 END
```

Listing 2

```
10 REM second demo DK
20 INPUT"What is your name",Name$
30 *SPOOL"Demo2"
40 PRINT"10 MODE 7"
50 PRINT"20 FOR col = 129 TO 138"
60 PRINT"30 P. 'CHR$(col)";
70 PRINTCHR$34;Name$;" is a fine person.";
CHR$34
80 PRINT"40 NEXT col"
90 PRINT"50 END"
100 *SPOOL
110 END
```


BBC & EDUCATION

Listing 3

```

10 REM D King DCT September 1983
20 MODE7:PROCINIT
30 ONERROR PROCspace:GOTO40
40 MODE7:PROCDBL(7,1,"MODE 7 TELETEXT GRAPHICS")
50 PRINT "If you require coloured text, you must""
insert the colour control code using""
60 PRINT "the red keys. The colour codes are"" given on
page 154 of the User Guide.""
70 PRINT "or you can use the DCT new RDM red key""ch
art."" "The colour codes use one letter space.""
80 PRINT "You can use double height letters.""
90 PROCspace:page:=1:line=1:CLS
100 PRINTTAB(1,0)"cursor UP/DOWN RETURN when finish
d"
110 PROCpos_curs
120 PRINTTAB(0,0)" DOUBLE HEIGHT LETTERS? Y or N on
ly"
130 *FX15,0
140 key_pressed=GET$
150 IF key_pressed<>"Y" AND key_pressed<>"N" THEN 1
30
160 Double$(line)=key_pressed$
170 PROCline(39)
180 PRINTTAB(0,0)" Next page? (Y,N,exit)
"
190 *FX15,0
200 key_pressed=GET$
210 IF key_pressed="N" THEN line=line+1:GOTO100
220 IF key_pressed="Y" THEN line=line+1:GOTO270
230 IF key_pressed<>"Y" THEN 190
240 page=page+1:line=line+1
250 X(line)=90:Y(line)=0:words$(line)="0":Pause$(line
)="N":Double$(line)="N":line=line+1
260 CLS:GOTO100
270 X(line)=90:Y(line)=0:words$(line)="End":Pause$(li
ne)="N":Double$(line)="N"
280 PROCdct:ONERRORGOTO300
290 GOTO320
300 VDU7:=SPDOL
310 PROCspace
320 PROCsaver
330 CLS:PRINT"" "Do you want to use the program again
?" "" " Press Y or N only"
340 key_pressed=GET$
350 IF key_pressed="N" THEN PROCend:END
360 IF key_pressed<>"Y" THEN340
370 RUN
380 REM Define PROCEDURES
390 DEFPROCpos_curs:PROCcursor("ON")
400 X=4:Y=10:GOTO450
410 key_pressed=GET
420 IF key_pressed="13" THEN Y=Y+1:IF Y>24 THEN Y=24:VDU7
430 IF key_pressed="19" THEN Y=Y-1:IF Y<1 THEN Y=1:VDU7
440 IF key_pressed="13" THEN460
450 PRINTTAB(X,Y):GOTO410
460 X(line)=X:Y(line)=Y
470 ENDPROC
480
490 DEFPROCline(max):PROCcursor("OFF")
500 PRINTTAB(0,0)" :PRINTSTRINGS(30," ")
510 PRINTTAB(0,0)"Words then RETURN: len=0
520 *FX15,0
530 key_pressed=GET
540 IF key_pressed="13" THEN30
550 IF len=max AND key_pressed<>127 THEN VDU7:GOTO52
0
560 IF key_pressed=127 THEN words$(line)=LEFT$(words$
(line),len-1):GOTO500
570 words$(line)=words$(line)+CHR$(key_pressed)
580 len=len(words$(line))
590 PRINTTAB(0,(line))" :PRINTSTRINGS(39," ")
600 IF Double$(line)="Y" THEN PRINTTAB(0,Y(line)+1)"
:PRINTSTRINGS(39," ")
610 X(line)=(max DIV2)-(len DIV2):IF Double$(line)="Y"
THENPROCDBL(X(line),Y(line),words$(line)) ELSE PRINTTAB
(X(line),Y(line)):words$(line)
620 GOTO530
630 PRINTTAB(0,0)" Delay (Y/N) :PRINTSTRINGS(12
0," ")
640 key_pressed=GET$
650 IF key_pressed<>"Y" AND key_pressed<>"N" THEN640
660 Pause$(line)=key_pressed$
670 ENDPROC
680
690 DEFPROCDBL(X,Y,words$)
700 PRINTTAB(X,Y)CHR$141:words$
710 PRINTTAB(X,Y+1)CHR$141:words$
720 ENDPROC
730
740 DEFPROCspace
750 CLS
760 IF ERRC<17 THEN REPORT:PRINTERR: ELSE PRINT""ESC
APE key_pressed""
770 PRINT""Press X to exit""or RETURN to cont"
780 *FX15,0
790 key_pressed=GET
800 IF key_pressed=00 OR key_pressed=128 THEN PROCend:
END
810 IF key_pressed<>13 THEN780
820 ENDPROC
830
840 DEFPROCcursor(o$)
850 IF o$="ON" THEN o$=255
860 IF o$="OFF" THEN o$=0
870 VDU23:11,0;0;0;0
880 ENDPROC
890
900 DEFPROCspace
910 PRINT :VDU132,157,131:PRINT"Press the SPACE BAR
to continue "" :VDU156
920 *FX15,0
930 REPEAT UNTIL GET=32
940 ENDPROC
950
960 DEFPROCsave
970 CLS:PROCDBL(3,1,"PUT BLANK CASSETTE IN RECORDER")
980 PROCspace
990 CLS
1000 *SPDOL:"CAPT"
1010 PRINT:10 MODE 7"
1020 PRINT:20 VDU23:11,0;0;0;0"
1030 PRINT:30 PROCspace"
1040 PRINT:40 READ P"
1050 PRINT:50 FOR page=1 TO P"
1060 PRINT:60 CLS"
1070 PRINT:70 REPEAT"
1080 PRINT:80 READ X,Y,words$,Pause$,Double$"
1090 PRINT:90 IF X=90 THEN 120"
1100 PRINT:100 IF Double$="" :PRINTCHR$34:"Y":CHR$34:"
THEN PROCDBL(X,Y,words$) ELSE PRINTTAB(X,Y):words$"
1110 PRINT:110 IF Pause$="" :CHR$34:"Y":CHR$34:" THEN PR
OCspace"
1120 PRINT:120 UNTIL X=90"
1130 PRINT:130 PROCspace"
1140 PRINT:140 NEXT page"
1150 PRINT:150 CLS:PROCspace:VDU23:11,255;0;0;0"
1160 PRINT:160 END"
1170 PRINT:200 DEFPROCspace: *FX15,0"
1180 PRINT:210 REPEAT UNTIL GET=32:ENDPROC"
1190 PRINT:250 DEFPROCDBL(X,Y,words$)"
1200 PRINT:260 PRINTTAB(X,Y)CHR$141:words$"
1210 PRINT:270 PRINTTAB(X,Y+1)CHR$141:words$"
1220 PRINT:280 ENDPROC"
1230 PRINT:500 DATA "page":REM no. of pages"
1240 L=505:line=1:FOR P=1 TO page:REPEAT
1250 PRINT:"L" DATA "X(line)":,"Y(Y(line))":,"CHR$34
:words$(line)":CHR$34"
1260 PRINT:"L" DATA "X(line)":,"Y(Y(line))":,"Double$(line)
":Double$(line)"
1270 line=line+1:L=L+5
1280 UNTIL X(line)=90
1290 NEXT P
1300 L=L+505:PRINT""L" REM DCT caption program"
1310 PRINT:"L" :L=L+5" REM generator <> dk 1983"
1320 *SPDOL
1330 CLS:PRINT"" "Do you want to save another copy?"
TAB(0)"Press Y or N only"
1340 *FX15,0
1350 key_pressed=GET$
1360 IF key_pressed="Y" THEN780
1370 IF key_pressed<>"N" THEN1340
1380 CLS:PRINT"" "To recover the program you have just
generated, follow the instructions""at the end of t
his program."
1390 PROCspace
1400 ONERROR PROCspace:GOTO40
1410 ENDPROC
1420
1430 DEFPROCinit:=0
1440 DIM (d),Y(d),words$(d),Pause$(d),Double$(d)
1450 *FX4,1
1460 *FX11,0
1470 ENDPROC
1480
1490 DEFPROCend
1500 CLS:PRINT"" "To recover generated captions program
""type NEW <RETURN>""then type *EXEC:CHR$34:"CAPT
":CHR$34:"
1510 PRINT"" (RETURN)""or press red key 10 now."" "P
rogram can then be LISTED, SAVED and""RUN as normal.""
*KEY0 NEW:*EXEC:"CAPT":*LIST*IM
1520 PROCChora:ENDPROC
1530 DEFPROCChora
1540 *FX4,0
1550 *FX12,0
1560 PROCcursor("ON"):ENDPROC
1570 DEFPROCdct
1580 dct$=CHR$157+CHR$132+" DCT "+CHR$129+"TV CAPTION$
Program generator"
1590 CLS:PROCDBL(0,1,dct$)
1600 VDU29,0,24,29,3
1610 ENDPROC

```

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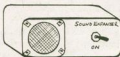
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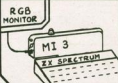
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Art of the matter

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Notes

- 1000 Start of program
- 1020 Define a function to make random number generation easier
- 1040 Reset the high-resolution screen. Also selects random colours, as well as the information about the line(s) to be drawn
- 1050 Main loop of the program. Cycles through to line 1110
- 1060 Draw the line(s) at the current position
- 1070 Test for any key being pressed to act as a command input
- 1080 If the key was 'S' then make a tidy exit from the program
- 1090 If the key was '[SPACE]' then pause the display until another key is pressed

- 1100 Any other key will cause a change of colour in the display
- 1110 Loop round to start of main program block
- 1120 When the program is to be stopped by pressing 'S' execution jumps out of the loop to this line, ready to tidy the screen and finish
- 1160 Procedure to draw the main line, and its 'Mirror-images'
- 1170-1200 Draw the line(s)
- 1210 Test to see if the 'X' value of the start of the line would fall outside of its quadrant. If it would, change its direction
- 1220 If the start of the line has changed direction, then change the colour as well
- 1230-1240 Test the 'Y' value of the start of the line
- 1250-1260 Test the 'X' value of the end of the line
- 1270-1280 Test the 'Y' value of the end of the line
- 1290-1320 Having established whether any change in directions have occurred, calculate the next actual position of the line
- 1330 End of the line draw procedure
- 1370 Procedure to change screen colours
- 1380 87% chance of entirely new (ie, Blank) screen
- 1390 Otherwise simply change the current ink colour
- 1400 When colour changes are completed, de-

- 1410 side on the new plot type
- 1450 End of new colour procedure
- Procedure to change the colours on the screen, WITHOUT changing the actual lines currently on display. (This can make some lines disappear, others reappear in new colours!)
- 1460 Select the new colours at random
- 1470 End of procedure to select colours
- 1510 Procedure to clear screen, and choose new positions/directions for the line(s).
- 1520 Choose random Border and Background colours
- 1530 Select high-resolution mode
- 1540 Choose the colours to draw in at first
- 1550 Select the first plot-type. (Exclusive-or)
- 1560-1590 Choose random co-ordinates to start the line(s)
- 1600-1630 Choose random directions for each of the end-points
- 1640 End of procedure
- 1680 Procedure to halt the display
- 1690-1710 Wait until no key is being pressed
- 1720-1740 Now wait until a new key is pressed
- 1750 Clear the dummy input variable so that the key press will not be treated as a command
- 1760 End of pause procedure
- 1800 Procedure to exit the program in a tidy fashion
- 1810 Restore the normal Text screen
- 1820 Set Black border and background
- 1830 Clear the text screen and select a text colour of green
- 1840 Halt the program
- 1850 End of the listing

```

1000 REM GRAPHICS DEMO
1010 :
1020 DEF FNR(X)=INT(RND(TI)*X)
1030 :
1040 EXEC SETUP
1050 LOOP
1060 EXEC DOLINE
1070 GET X$
1080 EXIT IF (X$="S")
1090 IF (X$=" ") THEN EXEC PAUSE
1100 IF (X$<>"") THEN EXEC NEWDISP
1110 END LOOP
1120 CALL EXIT
1130 :
1140 :
1150 :
1160 PROC DOLINE
1170 LINE X1,Y1,X2,Y2,CL
1180 LINE 159-X1,Y1,159-X2,Y2,CL
1190 LINE X1,199-Y1,X2,199-Y2,CL
1200 LINE 159-X1,199-Y1,159-X2,199-Y2,CL
1210 IF (X1+V1<0 OR X1+V1>79) THEN V1=-V1
1220 RCOMP:EXEC NEWDISP
1230 IF (Y1+V2<0 OR Y1+V2>99) THEN V2=-V2
1240 RCOMP:EXEC NEWDISP
1250 IF (X2+V3<0 OR X2+V3>79) THEN V3=-V3
1260 RCOMP:EXEC NEWDISP
1270 IF (Y2+V4<0 OR Y2+V4>99) THEN V4=-V4
1280 RCOMP:EXEC NEWDISP
1290 X1=X1+V1
1300 Y1=Y1+V2
1310 X2=X2+V3
1320 Y2=Y2+V4
1330 END PROC
1340 :
1350 :
1360 :
1370 PROC NEWDISP
1380 IF (RND(0)>.87) THEN EXEC SETUP
1390 RCOMP:ELSE:EXEC NEWCOL
1400 CL=MOD(CL,4)+1
1410 END PROC
1420 :
1430 :
1440 :
1450 PROC NEWCOL
1460 MULTI FNR(16),FNR(16),FNR(16)
1470 END PROC
1480 :
1490 :
1500 :
1510 PROC SETUP
1520 COLOUR FNR(16),FNR(16)
1530 HIRES 0,0
1540 EXEC NEWCOL
1550 CL=4
1560 X1=FNR(80)
1570 Y1=FNR(100)
1580 X2=FNR(80)
1590 Y2=FNR(100)
1600 V1=FNR(3)+1
1610 V2=FNR(3)+1
1620 V3=FNR(3)+1
1630 V4=FNR(3)+1
1640 END PROC
1650 :
1660 :
1670 :
1680 PROC PAUSE
1690 REPEAT
1700 GET X$
1710 UNTIL (X$=" ")
1720 REPEAT
1730 GET X$
1740 UNTIL (X$<>"")
1750 X$=""
1760 END PROC
1770 :
1780 :
1790 :
1800 PROC EXIT
1810 NRM
1820 COLOUR 0,0
1830 PRINT CHR$(147);CHR$(30)
1840 STOP
1850 END

```

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ZX COMPUTING

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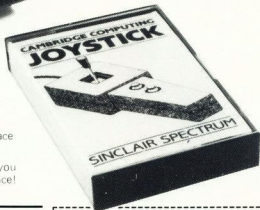


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
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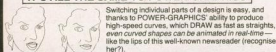


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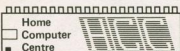
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Open Forum is for you to publish your programs and ideas. Take care that the listings you send in are all bug-free. Your documentation should start with a general description of the program and what it does and then give some detail of how the program is constructed. We will pay the *Program of the Week* double our new fee of £6 for each program published.

Monitor

on Ace

These routines are for those who enjoy experimenting with the Ace. First, enter the Forth words on the listing carefully.

The first routine BYTES prints out the contents in memory with the address, the decimal contents of that address, the contents in Hex and the Ascii character of that address. It has two parameters: the starting address and the finish address. To have a peek at the Rom enter this:

0 8192 Bytes

and the contents of the Rom will float up past your eyes. Enter the words CODE and HALT on page 147 of the Jupiter Ace manual. You can check that you entered HALT correctly by entering this:

HALT HALT 4 + BYTES

and the contents of HALT will be seen.

The next routine SEARCH gives the address of the first occurrence of a given byte. So to find the address of the first asterisk (code 42) on the screen enter:

42 9216 SEARCH (make sure there is already one on the screen)

If there is no asterisk in the addresses 9216 to 65535 (the top address) then the message 'NOT FOUND' will appear: if there is, on the other hand, the address will be given. You can try this on the Rom, on your machine code routines, anywhere (note that none of these routines are fast enough for use in games or suchlike).

The next routine STACK just prints out the contents of the stack out in hex. Use it by typing STACK.

The last routine S&R searches over a given area in memory and changes every specified byte to a given value.

This routine uses four parameters: the code to be altered, the code to change it to, the start address and the finish address.

Eg: to change every space on the screen to an asterisk type:

32 42 9216 9984 S&R

```
: BYTES
  SWAP 21 @ AT ." ADDRESS DEC. HE
  X CHR. " CR CR CR
  DO 21 @ AT I 21 @ AT I C@
  21 13 AT 16 BASE ! I C@ . DECIM
  AL
  21 20 AT I C@ EMIT CR CR CR
  LOOP
;
```

```
@ VARIABLE TAR
@ VARIABLE ADD
```

```
: SEARCH
  ADD ! TAR !
  BEGIN ADD @ C@ TAR @ =
  IF
  ADD @ 1+ ADD ! ADD @ -1 = UNTIL
  ." NOT FOUND"
;
```

```
: STACK
  15415 @ 15415 @ 12 +
  OVER OVER -
  IF DO
  I @ 16 BASE !
  2 +LOOP ELSE DROP DROP THEN
;
```

```
@ VARIABLE SEAR
@ VARIABLE REP
```

```
: S&R
  4 ROLL SEAR ! 3 ROLL REP ?
  SWAP DO I C@ SEAR @ =
  IF
  REP @ I C! THEN LOOP
  4
```

Monitor
by Ralph Lorenz

OPEN FORUM

Play

on Vic20

This program enables you to *Play* a melody using the numerics keys 1 to 8 and the 0 key as a rest. By using the 0 key you can syncopate your melody by using the "tone keys" (1-8) for the shortest notes that will occur in the melody, and making up the time with the 0 key.

The computer will remember the melody played, (up to 300 notes in the unpanded Vic). To leave the playing mode and enter the "playback" mode, press 9.

Details will then be shown on the screen of how to operate in the playback mode. The melody will normally be replayed in the original voice used, but by selecting

keys 1 to 4 during the replay you can change it. If the voicings are changed whilst a note is being played the note will continue on the same pitch whilst the new voice takes over the melody. This can be prevented by hitting key 0 to reset all the voices and then reselecting a voice.

The speed of playback can also be controlled by pressing + to increase the speed, or - to decrease it. When the replayed melody has finished the user can either replay it (using +), or he can return to the input mode (using -).

The current speed being used is displayed whilst the melody is being replayed along with the voicing code.

Full instructions are displayed at the appropriate times on the screen. Users with memory expansion can use many

more inputted notes simply by altering the values in lines 40, 160 and 310.

Program notes

Lines 50	Sets up variables, voice codes, and sets a voicing for immediate use when replaying sequence.
100	Sets values of note codes to be assigned to the VIC keys.
160-210	Accepts and stores the user's played melody.
230-305	Instructs the user on how to operate playback.
310-520	Replays the melody.
530 to end	Gives new go or replay option.

Interestingly, lines 270 and 600 are my method of error-trapping when waiting for a correct input (used here in *Get* situation but also applicable when using *Input*).

PROGRAM OF THE WEEK

```

10 REM VIC SEQUENCER
20 REM MUSIC MEMORY PROGRAM
30 REM R. BARTON
40 DIMP(300)
50 S1=36874:S2=36875:S3=36876:S4=36877:D=
  100:X=1
60 POKE36878,6
70 FORP=0TOD
80 READA(P)
90 NEXTP
100 DATA0,223,227,230,231,234,236,238,239
110 PRINT"VIC SEQUENCER"
120 PRINT" "
130 PRINT"PLAY MELODY ON NUMBER KEYS 1
  - 8 "
140 PRINT"KEY 0 FOR REST"
150 PRINT"AND KEY 9 TO ENTER REPLAY
  MODE"
160 FORZ=1T0300
170 GETA$:IFA$=" "THEN170
180 P(Z)=VAL(A$)
190 IFP(Z)=9THEN220
200 POKES1,A(P(Z))
210 NEXTZ
220 POKES1,0
230 PRINT"SEQUENCE STORED-"
240 PRINT"HIT P TO PLAY"
250 GETA$:IFA$=" "THEN250
260 IFA$="P"THEN280
270 GOTO250
280 PRINT"SEQUENCE PLAYING"
290 PRINT" "
300 PRINT"USE + OR - TO CONTROL
  SPEED"
302 PRINT"VOICE CONTROL ON KEYS-"
304 PRINT"1-2-3-4"
305 PRINT"KEY 0 RESETS VOICES"
310 FORZ=1T0300
320 IFP(Z)=9THEN530
330 IFX=0THENPOKES1,0:POKES2,0:POKES3,0:
  POKES4,0
340 IFX=1THENPOKES1,A(P(Z))
350 IFX=2THENPOKES1,A(P(Z)):POKES2,A(P(Z))
360 IFX=3THENPOKES1,A(P(Z)):POKES2,A(P(Z))
  :POKES3,A(P(Z))
370 IFX=4THENPOKES1,A(P(Z)):POKES2,A(P(Z))
  :POKES3,A(P(Z)):POKES4,A(P(Z))
380 FORT=1TOD
390 NEXTT
400 FORT=1T010:NEXTT
410 GETA$
420 IFA$=" "THEND=D-20
430 IFA$="-"THEND=D+20
440 IFD<0THEND=0
450 IFA$="0"THENX=0
460 IFA$="1"THENX=1
470 IFA$="2"THENX=2
480 IFA$="3"THENX=3
490 IFA$="4"THENX=4
500 PRINT"SPEED "D
510 PRINT"VOICE "X
520 NEXTZ
530 PRINT"END OF SEQUENCE"
540 PRINT" "
550 PRINT"HIT + FOR REPLAY OR"
560 PRINT"FOR NEW RUN"
570 GETA$:IFA$=" "THEN570
580 IFA$="+"THEN280
590 IFA$="-"THEN110
600 GOTO570

```

Play
by Richard Barton

Pontoon

on ZX81

This is a version of pontoon for the 16K ZX81. The idea of the game is to score as

high as possible up to 21. This is achieved by twisting until you have a high score. Stick by pressing the letter L.

The computer will always achieve a score between 15 and 21 so there is no point in sticking on less than 15. A five card

trick means you win the game automatically. Also, if you score too many (more than 21), then you lose the game automatically. 21 exactly is pontoon. You must win five games before the computer to win the match.

```

5 REM PONTON
10 LET ZX=0
18 LET YOU=0
30 LET T=0
40 LET Y=0
50 LET E=0
52 PRINT AT 0,5;"PONTON"
54 PRINT AT 2,2;"ZX=";ZX
60 PRINT AT 2,13;"YOU=";YOU
90 PRINT AT 4,0;"PRESS L TO ST
ICK"
100 PRINT "PRESS NEWLINE TO TWI
CK"
102 LET E=E+1
110 PRINT "YOUR NUMBER"
120 INPUT A$
130 IF A$="L" THEN GOTO 300
134 LET T=INT ((RAND*9)+1)
140 LET Y=Y+T
160 PRINT AT 6,0;"YOUR CARD WAS
A ";T
170 PRINT AT 10,0;"YOU HAVE ";Y
174 IF Y>21 THEN GOTO 200
176 IF Y<21 AND E=5 THEN GOTO 2
40
178 GOTO 52
200 PRINT AT 12,0;"WELL DONE-PON
TOON"
210 GOTO 300
220 PRINT AT 12,0;"BAD LUCK-TOO
MANY"
222 PRINT AT 16,0;"ZX WINS"
224 PAUSE 500

```

```

225 GOTO 362
240 PRINT AT 12,0;"EXCELLENT-FI
VE CARD TRICK"
250 PRINT AT 16,0;"YOU WIN"
252 PAUSE 500
254 GOTO 364
300 LET X=INT ((RAND*5)+15)
310 PRINT AT 14,0;"ZX SCORED ";
X
320 IF X>Y THEN PRINT AT 16,0;"
ZX WINS ";X;"-";Y
330 IF X<Y THEN PRINT AT 16,0;"
YOU WIN ";Y;"-";X
340 IF X=Y THEN PRINT AT 16,0;"
ITS A DRAW"
354 PAUSE 500
345 IF X=Y THEN GOTO 370
350 IF X>Y THEN GOTO 362
356 IF X<Y THEN GOTO 364
362 LET ZX=ZX+1
363 GOTO 370
364 LET YOU=YOU+1
370 IF ZX=5 THEN GOTO 400
380 IF YOU=5 THEN GOTO 450
382 CLS
390 GOTO 20
400 PRINT AT 18,0;"ZX WINS THE
MATCH ";ZX;"-";YOU
420 STOP
450 PRINT AT 18,0;"YOU WIN THE
MATCH ";YOU;"-";ZX
460 STOP

```

Pontoon
by G Burrows

Strings

on BBC

This program is a simulation of those

graphs that you used to draw in primary school using many straight lines to build up curves as if using strings. The program

firstly draws three separate graphs before displaying them superimposed on each other.

```

10 REM-----
20 REM          STRINGS
30 REM          BY    J.D CHURCH
40 REM-----
50 MODE4
60 PROC_1:PROC_WAIT:PROC_2:PROC_WAIT:PROC_3:PROC_WAIT:PROC_1:PROC_2:PROC_3
70 END
80 CLS
90 ENDPROC
100 DEFPROC_WAIT
110 TIME=0
120 IF TIME < 200 THEN 120
130 CLS
140 ENDPROC
150 DEFPROC_1
160 FOR X=1140 TO 140 STEP -30
170 MOVE X,12: DRAW 140,(1152-X)
180 MOVE X,12: DRAW 1140,(X-128)
190 MOVE X,1012: DRAW 140,(X-128)
200 MOVE X,1012: DRAW 1140,(1152-X)
210 NEXT X
220 ENDPROC
230 DEFPROC_2
240 FOR X=0 TO 500 STEP 30
250 MOVE 640,(512+X): DRAW(1140-X),512
260 MOVE 640,(512-X): DRAW(1140-X),512
270 MOVE 640,(512+X): DRAW(140+X),512
280 MOVE 640,(512-X): DRAW(140+X),512
290 NEXT X
300 ENDPROC
310 DEFPROC_3
320 FOR X=0 TO 500 STEP 30
330 MOVE(640-X),(512-X): DRAW(140+X),(1012-X)
340 MOVE(640-X),(512-X): DRAW(1140-X),(12+X)
350 MOVE(640+X),(512+X): DRAW(1140-X),(12+X)
360 MOVE(640+X),(512+X): DRAW(140+X),(1012-X)
370 NEXT X
380 ENDPROC

```

Strings
by Jonathan Church

OPEN FORUM

3D Bar Graphs

on Spectrum

Although this program was written on a 16K Spectrum it could be adapted for use with the ZX81. It enables you to draw Bar graphs in 3D.

The subroutine in line 1000 produces the 3D effect. The program itself might make a useful subroutine in a longer program.

```
10 BORDER 1:INK 7:PAPER 1
20 PRINT FLASH 1;AT 0,9;" BAR GRAPHS "
30 LET C=0:LET X=0:LET Y=10:LET I=0
40 INPUT "NUMBER OF BARS (1-10) ";B
50 IF B <= 0 OR B > 10 THEN GOTO 40
60 INPUT "PERCENTAGE OF BAR (1-100) ";P
70 IF P <= 0 OR P > 100 THEN GOTO 60
80 FOR J= 0 TO P:FOR K= X TO Y
90 PLOT K,J
100 NEXT K:NEXT J
110 PRINT AT 6,I;P
120 LET X=X+25:LET Y=Y+25
130 LET I=I+3:LET C=C+1
140 GOSUB 1000
150 IF C=B THEN STOP
160 GOTO 60
1000 DRAW 5,5:DRAW 0,-P:DRAW -5,-5
1010 DRAW -10,P:DRAW 5,5:DRAW 10,0
1020 RETURN
```

3D Bar Graphs
by Harman Patel

Dump

on Vic20

This subroutine, when run will list all variables that have already been set up except those that are used in the routine

itself, so the main program should therefore not include any variables that are used in this routine.

To initialise the program use Goto 60000. If there are more than 20 variables the routine will wait until you press a key before printing the rest.

Program notes

Lines	
60000	Find start of variable area.
60001-3	Is screen full?
60004-7	Which type of variable?
60008-9	Print out string.
60010-11	Print out integer number.
60012-17	Print out floating point number.

```
60000 A=PEEK(45)+256*PEEK(46):C=0
60001 C=C+1:IFC<20THEN60004
60002 GETA$:IFA$=""THEN60002
60003 C=0
60004 IFPEEK(A)>127ANDPEEK(A+1)>127THEN60010
60005 IFPEEK(A)<128ANDPEEK(A+1)<128THEN60012
60006 PRINTCHR$(PEEK(A));:A=A+1:IFPEEK(A)=128THEN60008
60007 PRINTCHR$(PEEK(A)-128);
60008 PRINT"$=";CHR$(34);:A=A+1:N=PEEK(A):A=A+1:L=PEEK(A):A=A+1:H=PEEK(A):SP=L+2
560H
60009 FORL=SPTOSP+N:PRINTCHR$(PEEK(L));:NEXT:PRINT:A=A+3:GOTO60001
60010 PRINTCHR$(PEEK(A)-128)CHR$(PEEK(A+1)-128)"%=";:A=A+2:N=PEEK(A):IFN<127THE
N=N-256
60011 N=N#256:A=A+1:N=N+PEEK(A):PRINTN:A=A+4:GOTO60001
60012 IFCHR$(PEEK(A))="A"THENEND
60013 PRINTCHR$(PEEK(A))CHR$(PEEK(A+1))"=";:A=A+2:N=PEEK(A)-129:IFN<0THENN=N+129
60014 N=21N:A=A+1:S0=PEEK(A):S4=1:IFN<127THENS0=S0-128:S4=-1
60015 S0=S0*(1/128)*N:A=A+1:S1=PEEK(A)*(1/(128*256))*N
60016 A=A+1:S2=PEEK(A)*(1/(128*256*256))*N:A=A+1:S3=PEEK(A)*(1/(128*256*256*256))
)*N
60017 S0=(S0+S1+S2+S3+N)*S4:PRINTS0:A=A+1:GOTO60001
```

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by Paul Lillington



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PCW 2

OPEN FORUM

Pinball

on Spectrum

This game should work on the 16K

machine. It is a kind of pinball with a touch of Breakout because, in place of the usual flippers there is a bat which can be moved using keys 5 and 8. Points are scored when the ball hits a number.

Program notes

20-40 Defines ball
100-120 Print playing area
135-250 Main game
500-530 Lose one ball
1000-1050 Game over

```

1 REM *****
# PINKBALL #
# © 1983 S.J. Bennett #
# *****
10 LET hs=0: LET s$=""
20 FOR n=USA "a" TO USA "a"+7
30 READ a: POKE n,a: NEXT n
40 DATA 0,60,120,a,a,a,60,0,0
50 LET sc=0: LET li=3
60 BORDER 0: PAPER 7: INK 9: F
FLASH 0: BRIGHT 0: OVER 0: INVERS
0: CLS
100 INK 1: PAPER 5: PRINT AT 5,
5, " "
PRINT AT n,5, " "
n
110 PRINT AT 21,5, " "
120 FOR n=1 TO 9: PRINT AT INT
(RND*14)+6,INT (RND*9)+6: INK
6: INK 1;n: NEXT n
130 LET bx=7: LET by=10: LET bx
1=1: LET by1=-1: LET x=6
131 PRINT AT 1,12: PAPER 7: BRI
GHT 1: INK 1: "BALLS ";li
133 PRINT AT 1,22: BRIGHT 1: PA
PER 7: INK 1: "HIGH ";hs;AT 2,22
"BY ";s$
135 LET as=SCREEN$(bx,by)
140 IF as<" " THEN LET sc=sc+U
AL as: BEEP .1,50: LET q=AND: LE
T w=RND: LET bx1=(q+.5)+(q+.5):
LET by1=-(w+.5)+(w+.5)
150 PRINT AT bx,by: "0"
160 LET paper=5: LET ink=1: IF
as<" " THEN LET paper=6: LET in
k=0
170 PRINT AT 21,x-1: INK 2: PAP
ER 1: " "
AT bx,by: INK ink;
PAPER paper;as
180 IF bx<7 THEN BEEP .005,10:
LET bx1=bx-1
190 IF by>12 OR by<8 THEN LET b

```

```

y1=-by1: PRINT AT bx,5: INK 1: "
AT bx,15: " "
200 LET bx=bx+bx1: LET by=by+by
1
210 LET x=x+(INKEY$="0" AND x<1
2)-(INKEY$="5" AND x>6)
220 IF bx=21 THEN IF ABS (x+2)
-by>1 THEN GO TO 500
230 IF bx=21 THEN BEEP .05,-10:
LET bx1=bx-1
240 PRINT PAPER 7: INK 1: AT 1,1
: BRIGHT 1: "SCORE ";sc
245 PRINT AT 5,5: " "
250 GO TO 135
500 FOR n=0 TO -50 STEP -2.5: B
EEP .05,n: NEXT n
505 LET li=li-1
510 PRINT AT 1,12: PAPER 7: BRI
GHT 1: INK 1: "BALLS ";li
515 PRINT AT 1,22: BRIGHT 1: PA
PER 7: INK 1: "HIGH ";hs;AT 2,22
"BY ";s$
520 IF li<0 THEN GO TO 1000
530 GO TO 100
1000 RESTORE 1010: FOR n=1 TO 18
: READ a,b: BEEP a: NEXT n
1010 DATA 1,2,1,2,1,4,1,6,1
6,2,10,2,6,1,3,5,3,1,3,1,6
2,1,1,1,0,1,-1,1,5,1,0,1,6
1,3
1020 PRINT PAPER 7: INK 2: AT 15,
20: FLASH 1: "GAME ";FLASH 0: " "
FLASH 1: "OVER "
1030 IF sc>hs THEN LET hs=sc: IN
PUT "TYPE YOUR INITIALS ";s$: IF
LEN s$>3 THEN GO TO 1030
1040 PRINT AT 1,22: BRIGHT 1: PA
PER 7: INK 1: "HIGH ";hs;AT 2,22;
s$
1050 PRINT AT 3,3: INK 3: PAPER
9: FLASH 1: "Press ENTER to play
again": INPUT LINE xs: GO TO 50

```

Pinball

by Steven Bennett

Microradio

GW6JJN



Dots and dashes

If you sit and patiently tune a short wave radio, sooner or later you will come across morse code. Morse code consists of a series of seemingly random dots and dashes. What you may be hearing is a radio amateur in some distant part of the world, a weather station in Antarctica or even the seventh fleet. How nice it would be to understand these exotic messages.

There are two ways to do this. Firstly, you can learn

morse and translate it yourself or secondly, use the micro to turn it all into English, or French or Russian or whatever.

In both these cases the microcomputer can help. In learning morse, it can be a very patient tutor. In receiving, it can be a sophisticated communications decoder. It all depends on the program.

To write a morse tutor program, one must tell the micro what the code is. Data lines that look like:

```

100 DATA "A:", "B:", "C:", "D:", "E:", "F:"

```

can all be read into a string array called as. The various micros involved can then use the strong manipulation facilities available to find the first letter of each string, then Beep or Sound or whatever, a short sound of the ASCII code for

"." is found, or a longer sound if the "." is encountered.

The convention in morse is to make the dash sound three times longer than the dot. The length of the spaces between is up to you and the more proficient you become, then the shorter the gap. There are several morse learning programs on the market and I hope to be reviewing some soon.

As for receiving morse by computer, this is more difficult but very worthwhile. Molimerx Ltd supply a program for the TRS 80 that sends and receives morse very well under software control, as long as there is a clear signal. With an interface that can filter out interference, the receiving of morse is simple and the world is yours.

In order not to make this

column too machine specific, I hope to be giving the addresses of various micro-radio user groups, most of whom publish a news letter with listings for specific micros. This week I'll mention SARUG (Sinclair Amateur Radio User Group). Info from Paul Newman G4NP, 3 Red House Lane, Leiston, IP16 4JZ. Another group is RAMTOP and deals with a range of micros in radio. Info from: RAMTOP, The School, Wellingborough, Northants, NN8 2BX. Anyone else who wants a mention, please send me details.

Ray Berry GW6JJN

This series of articles is designed for radio and microcomputer enthusiasts alike. If you have any queries that you want answered, hints and tips to share, or topics that you would like to see covered, write to: Ray Berry, Microradio, Popular Computing Weekly, 12-13 Little Newport Street, London WC2R 3LD.

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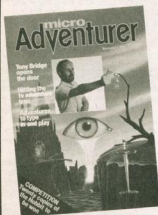
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Tony Bridge's Adventure Corner



Primeval man

To start another week of Spectrum Adventures, I want to make an update of my previous Adventure Corner.

In PCW No 17 (April 28), I took a look at *Knight's Quest*, which is from Phipps Associates. Written by Mike Farley, this program is, graphically, anyway, a little like *The Hobbit*, using a split-screen display. Text input from the player, and information from the computer appears in the lower screen, while in the top half a graphic representation of the present location appears.

The program, I found then, is rather slow in response times, and the pictures not as attractive as those in *The Hobbit* (as well as taking up to 18 long seconds to be drawn in some cases). They do the job well enough, though. The program does not aspire to independent action for its characters, either.

To complement *Knight's Quest*, Phipps has released two more Adventures, *Magic Mountain* and *Pharaoh's Tomb*, both of which once figured on an Adventure anthology tape for the ZX81 — and I believe that *Greedy Gulch*, from the same tape has also made an appearance, though I haven't seen this one as yet.

The new programs follow the same format and in fact, Farley probably wrote one main skeleton program and writes in different scenarios as appropriate, like Scott Adams. This is not to belittle, however, the hard work that obviously goes into these Adventures, nor the enjoyment to be had from them. If you got on well with K's Q, then rest assured that the new Phipps Adventures will enthral you in the same way.

Another new Adventure employing the Asplit-screen technique is *Smuggler's Cove* written by John Keneally for Quicksilva. This follows the good old traditional route, and the graphics are rather simpler than those of *The Hobbit* — this has the advantage of making them very much quicker to appear than in either Phipps or Melbourne House. None of the usual long wait for the pictures to be filled with colour.

While only two-word commands are accepted by the computer, its responses

are unusual and full of humour — Keneally makes full use of the smuggling theme, and you'll be called "Lubber" and "M'Dear" in a heavy Robert Newton accent. In fact, the whole thing is couched in mock Pirate/Cornish language throughout.

If you enjoy graphic/text programs of this type, check out Richard Shepherd's latest offering, *Isle Of Xaro*, which also has some pretty graphics (not, this time, in 3D). This is closer to the traditional form of Adventure than is usual with Shepherd, being written by a third party author.

Devils Of The Deep is, however, written by Shepherd himself, and follows the house style which players of *Superspy* and *Transylvanian Tower* will be familiar with. As yet, I've only seen this one at Microfairs, so I can't tell you much about the plot, but the mechanics involve the player moving around a 3D representation of the sea-bed, picking up weapons and treasures.

To stray from the mainstream of Adventure for a while, we'll look at a program which its authors, Microsphere, describe as dealing with "the greatest Adventure of all time". This is *Evolution* — these guys are starting with the BIG one!

You can play at being the Supreme Being (Earth Sector, 3500 BC), and help man raise himself from the primeval ooze to civilisation. There is a time limit shown on-screen, and a temperature scale.

Starting off with plants, which you will need in order for oxygen to evolve, you choose which descendants of each branch you would like to create. If you choose correctly at each stage, animals will eventually emerge, and similarly, these must be nurtured. Random disasters occur just to spice things up a bit — if you get in a real pickle, you can even make a disaster happen, it sometimes helps!

The program draws on a large database of all the branches of the plant and animal kingdoms to give you details of any species. The basis of the Adventure, if it can be called that, appears to be Microsphere's spreadsheet program, *Omnicalc*. If I'm right, *Evolution* would be the most attractive use I've yet seen for an electronic spreadsheet, and a very attractive way to gain knowledge of the cause and effect of evolution.

Management games, of which *Evolution* could be called an example, are often lumped together with Adventures, and I suppose the pairing is as legitimate as any other. *Dictator*, from DK'Tronics, is one such; available some time ago at £9, the program is now a lot cheaper, but minus the manual — the instructions are now on the cassette inlay, and you'll need a magnifying glass!

It's well worth looking at if you like this sort of thing. You have just become President (pronounced Dictator) of the Republic of Ritimba. Your goal is to rule as long as possible, while salting away as much as you can in your Swiss bank account. This entails, as any self-respecting Dictator knows, playing off all sides against each

other, ensuring that no one but yours truly ends up with the loot.

Your secret police, who must at least on the surface be looked after more than any other faction, are your eyes and ears, and present you with reports throughout the game. You must use these reports to gauge the feelings of all the groups who may bring you down. It is up to your abilities at playing brinkmanship to appease those factions that are particularly restless at any given moment — but it helps to have a speedy helicopter on hand!

Dictator is a very complex program, but the sound and graphics keep interest high, along with a great line in humour.

Now to this week's crop of problems. And to refer back to *Knight's Quest*, a number of people are getting in a bit of a tizzy in some parts of this infuriating Adventure. The Dragon is a bit unfriendly — but you may find that he is merely hungry.

Others are lost in the deserted waste land. I've been there myself and try to avoid it now — but I'm not sure if it has a purpose. Getting on to the Secret Ledge, and avoiding the Giant are other problems. If you've completed the Adventure, and fancy imparting your knowledge to others — you know what to do!

Meanwhile, back at the Dragon 32, Elaine Chan of Chester is having trouble with *Dragon Mountain*. Can you tell her how to give commands concerning torches and dark rooms (I should think one would lead to the other), and also, she would like to know the secret of the Spell Book.

A couple of weeks ago, I mentioned a couple of Adventurers who asked if there were any good programs for the Vic20 apart from the ubiquitous Scott Adams Adventures. Graham Moss writes to me from Ipswich to tell me of a game for the Dragon soon to be released by Martech. This will be called *The Quest Of Merravid*, which Martech has called a sense of humour. Apparently the game involves travelling around the land of Thargon, the player trying to piece together a suit of armour, before doing battle with a nasty Dragon. This is the first in a series of programs which will also be available for the Commodore 64.

Next week I will be looking at *Quest*, the new Adventure from Hewson Consultants, but in the meantime has anyone a solution to the Castle, Bug-Byte's new Adventure?

This series of articles is designed for novice and experienced Adventurers alike. Each week Tony Bridge will be looking at different Adventures and advising you on some of the problems and pitfalls you can expect to encounter. So, if you have an Adventure you want reviewed, or if you are stuck in an Adventure and cannot progress any further, write to: Tony Bridge, Adventure Corner, Popular Computing Weekly, 12-13 Little Newport Street, London WC2R 3LD.



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WISHFUL THINKING

Kevin Guerrio of Hamerton Road, Birmmington, Kent, writes:

Q Could you please explain why on my Vic20 when using the command `Fre(0)` along with the command `Poke 56, 144` I get the result 32758?

A Is this the true figure of unused bytes on my unexpanded Vic, or is it just wishful thinking on behalf of my computer? I have no reference guide so I do not know what `Poke 56, 144` does.

A I am afraid that you have not found a mysterious way of increasing the memory available on your Vic; what in fact you are doing is Poking into the upper part of the two-byte number that keeps track of the end of the memory. Obviously, by changing the value of this pointer, you can change the Frequency value returned with the `Fre` command. In fact, you can even have minus memory. Try this:

```
10 FOR A = 1 TO 160
20 PRINT
30 PRINT B = 0 TO 100 : NEXT B
40 POKE 56,A
50 PRINT FRE(0),A
60 NEXT A
```

Line 20 is only for clarity, and line 30 gives you a chance to actually read what is coming up on the screen. Just press `Break` to stop the program.

VIDEO OUTPUT

M. Wright of Dundas Street, Spennymoor, Co Durham, writes:

Q I have a Spectrum and my question is: what sort of output is available on the video connection on the expansion port? As I am a TV engineer it would be possible

for me to convert a conventional television to a monitor (either RGB or Composite Video).

A I can find nothing in the manual, or in any of the books on the Spectrum. Also when it comes to *Loading* and *Saving* problems, it could be 'dirty mains supply' that is amplified by the cassette and so upset the recording.

A It is possible. You will need to use an isolation transformer, and earth the chassis of the television set. Also, depending on the design of the set, you might need to use a video sync splitter. The actual section of the circuitry to cut the signal into is the I.F. circuits. Disconnect the last stage of the I.F. section and route the signal into the video amp instead, using a capacitor to control the voltage.

The signal from the video connection is one volt peak to peak, at 75 ohms.

SCHOOL PROGRAMS

Stephen Piper of Orchard Avenue, Ashford, Middlesex, writes:

Q I am a Dragon 32 owner and so far I am quite pleased with it. One of the reasons that I bought this particular computer was that I thought a lot of educational software would become available for it, as with the Vic20. But as yet I cannot find anything suitable. I am currently starting courses for my 'O'-levels, and I wondered if you could tell me of a company that might be releasing some soon.

A Unfortunately you do not say what O-levels you are taking, so I do not know what exactly you are looking for. Educational software lags behind games software by six to nine months, certainly that was the case with the Spectrum, and to a lesser extent, the BBC. I think we will be seeing a lot more educational software for the Dragon by Christmas. The Dragon suffers somewhat by not being one of the micros recommended in schools. I hope that this scheme will soon be extended to include the Dragon, and the Commodore 64.

However, there are some software houses with O-level

material for the Dragon: Micro-De-Bug Consultancy, 60 Sir Johns Road, Selly Park, Birmingham B29 7ER (O-level or CSE revision in Physics, Maths and Biology, as well as general knowledge and general spelling). Garland Computing of 35 Dean Street, Plymouth PL9 (programs to test the verification of Ohms Law and the principles of direct current motors). Among others you can get French Verbs from Premier Microsystems, 208 Croydon Road, Anerley, London SE20 7XY, and a general revision package from Tiger Software, Dept D2, Devonshire Street, Monkwearmouth, Tyne and Wear.

HI-RES ZX81

J Killan of Forest Road, Walthamstow, London E17, writes:

Q I still use a ZX81 because I have found it very easy to learn on. I was going to get a graphics Rom for it, but now a friend tells me that there is a High Resolution graphics tape available that is just *Loaded* like a normal program. Is this true, and, if so, where can I get it and how much does it cost?

A For a supposedly out of date and outmoded computer, the ZX81 is still doing remarkably well. The hi-res tape you want will give you the same screen as the Spectrum, 256 x 192. It takes up less than 1K of Ram and costs £5.95. You can get it from Computer Rentals, 140 Whitechapel Road, London E1.

DRAGON DUMP

P. L. Sturgess of Wickhurst Lane, Broadbridge Heath, Horsham, Sussex, writes:

Q Please can you advise me on how to transfer screen graphics from my Dragon 32, on to a TRS 80 DMP1000 printer.

A I am anxious to write and

transfer symbols like scout badges for notepaper and headings. I assume that it would take the form of some sort of Hi-Res screen dump, but writing it is beyond my computing powers at the moment.

A There is a solution. A Caveman Computers do a program that will dump Hi-Res graphics on to your DMP100 in any of the two-colour modes. The tape costs £7.95, and is available from: Caveman Computers, The Cave House, 55 Iona Road, Windy Nook, Gateshead, Tyne and Wear.

I have had many letters recently about ports and interfaces — a lot of people want to know what to look out for if they are thinking of buying a computer.

A port is essentially the same thing as an interface, both allow your computer to be connected with and communicate to, other pieces of equipment, usually printers, but also robots, digital tracers, etc.

The two most common ports are the RS232 serial port and the Centronics parallel port. A serial port passes information (data) 1 bit at a time whereas a parallel port passes it 1 byte (8 bits) at a time. Theoretically, therefore, a centronics port should be faster. However, since most printers can only handle up to 80 characters a second, the practical differences are negligible.

Many computers will be equipped with one or even both of the above ports, but don't be misled by a phrase like 'Centronics type'; this might mean that the port lacks some data lines important for some purposes — find out exactly what you will need and check the specifications. I should add that both the Spectrum and the ZX81 lack such ports (although you can buy them as add-ons) and yet they have still sold well.

Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem *Peek* it to Ian Beardsmore and every week he will *Poke* back as many answers as he can. The address is *Peek & Poke*, PCW, 12-13 Little Newport Street, London WC2R 3LD.

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* *The Working Dragon 32* "It's a good one
PERSONAL COMPUTER NEWS — 20 MAY '83

* *The style of The Working Commodore 64 is
easy to follow and informative"*
PERSONAL COMPUTER NEWS — 18 AUGUST '83

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— and its easy to read as well. It is impossible
to overpraise"*
PERSONAL COMPUTER NEWS — 25 AUGUST '83

* *"There clearly is a need for books like
The Working Dragon 32 which provides more
than just games"*
PRACTICAL COMPUTING — SEPT '83

* *"Blind Alley is simply madly addictive. It is
bound to be hugely popular"*
WHAT MICRO — JULY '83

Books

- ☐ The Working Spectrum £5.95 (ISBN: 0 304608 00 9)
- ☐ Spectrum Adventures £5.95 (ISBN: 0 304608 07 8)
- ☐ Spectrum Machine Code Applications £6.95 (ISBN: 0 304608 17 3)
- ☐ The Working Commodore 64 £5.95 (ISBN: 0 304608 02 5)
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NEW RELEASES

MUSICAL



Pettigrews Diary is a 90K adventure game for the Dragon 32. The game is divided into three sections. The Burning farmhouse, London Frolics and European Trek, the first and last of which are illustrated with hi-res graphics.

A musical score accompanies the various scenes which take you from the English countryside via London to Europe, as you try to unravel the secrets of the mysterious diary.

The program comes with a set of instructions to guide you through the adventure.

Program *Pettigrews Diary*
Price £7.95
Micro Dragon 32
Supplier Shards Software
189 Eton Road
Ilford
Essex IG1 2UQ

ALIEN

The next batch of games from Virgin will soon be ready. The company will be covering Spectrum, BBC B, Commodore 64 and TI99/4A.

Quetzacoatl is a graphics adventure which Virgin say is one of their best Spectrum releases yet — they are also proud of *Falcon Patrol* for the 64, an air battle game with 3D graphics.

On the BBC there is *Microbe*, a sophisticated 'shoot em up' game with multi levels and impressive graphics.

A gigantic alien is threatening earth — the only way to destroy it is via bacterial war-

fare. You must fight through its bodily defences with your microbes until it weakens and dies. The program is by Simon Birrell, who is maintaining his insatiable obsession with this release — his previous one was *Bug Bomb*, also on the BBC.

Program *Microbe*
Price £7.95
Micro BBC B
Supplier Virgin Games
61 Portobello Road
London W11

BLISS

The great thing to my mind about *Mad Martha* was that it proved that virtually anything could be the subject of an adventure game; ie, that they didn't all have to involve swords and rings of powers.

Fans of the "non-dramatic" or "kitchen sink" adventure game will be glad to hear that *Mad Martha II* is on its way.

The tremulous Henry seems to have patched up his marital differences with Martha who (I suppose) has been let out of Holloway after her vicious assault — they go on holiday to Spain with their son Arbutnot. Now read on.

Henry has built up a steamy pen pal relationship with an exotic beauty and is just waiting for a chance to escape from Martha's clutches for a few moments of bliss with his paramour.

The problem is that he is constantly under the watchful eye of Manuel, Martha's Spanish waiter cousin who can't speak English. . .

Sounds like a winner.

Program *Mad Martha II*
Price £6.95
Micro Spectrum 48K
Supplier Mikrogen
1 Devonshire Cottages
London Road
Bracknell
Berkshire
RG12 2TO

CLASSROOM

Micro Concept is a software company dedicated to the professional implementation of good educational software ideas from teachers. All its programs are intended for use in the classroom by teachers with no knowledge of programming.

The idea is that whilst teachers may (sometimes) know how to teach, they seldom know how to write good programs.

Micro Concept is covering a wide range, with programs on bearings, addition, and one that I particularly noticed, prisms.

This latter program uses a graphic display of a prism to explain surface areas and the various differing calculations that are required, depending on whether it has a square, triangular or cylindrical base.

Program *Prisms*
Price £7.50
Micro BBC B
Supplier Micro Concept
22 Allenby Avenue
Grimby
Humberside

CLONED



After the highly abstract *Knot* in 3D, New Generation Software has returned to a more conventional kind of game with *Corridors of Genon*.

You must find your way through 30 circular corridors and deactivate the computer of Genon. Your way is barred by various doors, each of which require a three digit code before they can be opened. The computer can also defend itself using the guardian of the corridors, Bogul. Bogul does not kill you at this point but if he catches you, your ability to discover the door codes is impaired.

If you manage to find the computer you can destroy it by discovering its own special three digit code (a sort of mini mastermind game). Then of

course, you must escape — not easy because Bogul has cloned and should one of him find you even once — you are dead.

I should stress that fans of New Generation's other games are not likely to be disappointed, all the corridors (and Bogul's nose) are done with the usual impressive 3D effects.

Program *Corridors of Genon*
Price £5.95
Micro Spectrum 48K
Supplier New Generation Software
16 Brendon Close
Oldland Common
Bristol BS15 6QE

SCREEN

The Spectrum's screen display, with 32 characters per line, is limited for many purposes.

Myrmidon Software's *Micro-print* gives you extra Basic commands to use either 42 or 51 characters — a total of 1,224 characters per screen.

The system is simple to use, requiring only Basic instructions. The program is intended to be particularly useful for those who use their computers to create displays, or who require a great deal of text on one screen.

Program *Micro-print 42/51*
Price £5.00
Micro Spectrum 16/48K
Supplier Myrmidon Software
PO Box 2
Tadworth
Surrey KT20 7LU

SINGLE KEY

BBC owners — now you can turn your micro into a Spectrum! Actually this slightly bizarre objective is not quite so silly as it sounds for what we are talking about is single key entry.

Clares has a program which will give you the standard basic words via single key presses — just like a Spectrum. The program, *S-Key*, caters for both Basic I and Basic II on the one tape.

Program *S-Key*
Price £5
Micro BBC 32K
Supplier Clares
222 Townfields Road
Windsor
Cheshire CW7 4AX

NEW RELEASES

LINE BY LINE



A Trace facility is being included on more and more of the new computers that are being launched — the ability to step through your program following it line by line is even more useful to the novice programmer than, say, a Re-number facility.

However, most of the current best selling micros don't have this facility. Consequently, you have to buy it as a utility. Texgate, who has

already launched a variable speed Trace for the Spectrum, has now converted it for the ZX81, which, it is worth noting, is still selling better than some other, more glamorous, machines.

Program Trace
Price £5.95
Micro ZX81 16K
Supplier Texgate Computers
14 Brook Lane
Corfe Mullen
Dorset BH12 3RD

MUSIC BIZ

Personally, I've never been that impressed by simulations of football or cricket, simply because I'm not interested in the subjects. For those of us who are not sports fans, there is a chance to simulate a different kind of enterprise — the pop business.

In *Top of the Pops* you own a record company and must, quite simply, produce best selling records and make a lot of money — unlike the real pop business, you are not interested in the quality of your product.

Up to 10 people can play.

deciding how much to spend on promotion and watching the fate of their records in the all important chart.

The program supports a printer and can be saved on tape should you wish to take a break from wheeling and dealing at any point.

Program Top of the Pops
Price £4.99
Micro Vic20 (+8K)
Supplier Sophisticated Games
27 Queens Road
Keynsham
Avon BS18 2NQ

WHO DUNNIT

Murder at the Manor is a graphical adventure game from a new company — Gemtime.

Like *The Hobbit* it is capable of sophisticated sentence analysis so that, for example, you can "fight the butler with the brick" and interrogate the characters.

Each play of the game gives different clues and a different murderer. The game operates on its own time scale — at the end of each day night will fall and everything becomes more difficult and dangerous.

The game has over 110 different locations and the graphics are very nearly of *Hobbit* quality. Highly recommended.

Program Murder at the Manor
Price £6.95
Micro Spectrum 48K
Supplier Gemtime
16 Ben Ledi Road
Kirkcaldy
Fife KY2 5RP

ZENITH

One of the more interesting general guides to computers and computing is *Electronic Life* by Michael Crichton.

The author is perhaps best known for his science fiction novel *The Andromeda Strain* which was also made into a film.

The book is arranged alphabetically into subjects like Buying a Computer, Hiring the Computer, Printer and finally Zenith which comes to the philosophical conclusion that "Human beings will always have something else to do. And so, for that matter,

will their machines."

Although there are programming tips and even a few programs, I think it will be most interesting to those who are concerned about the philosophical and social significance of computers.

Book Electronic Life
Price £7.95
Micro General
Supplier William Heinemann
10 Upper Grosvenor
Street
London W1X 9PA

ATTACK



Just released for the BBC is *Cylon Attack* a sophisticated arcade game from A + F Software. You are an interceptor pilot on board an earth supply ship — you must fight off the Cylon hordes and send them back to their planet.

The game features include launch and landing sequences, climb and turn, radar, fuel and lasers and, a good idea not adopted by most software houses, the opportunity to save and load high scores. The game runs in 32K on all the BBC operating systems.

Program Cylon Attack
Price £7.90
Micro BBC (32K)
Supplier A + F Software
830 Hyde Road
Manchester M18 7JD

Losers plays PRO-CELEBRITY GOLF



Ziggurat



Outer limits

Why was Alan Turing (of whom we talked last week) so keen on machine intelligence? The answer lies in some work that Turing did before the Second World War, concerned with the "limits of computation".

The limits of computation is a grand way of saying "What is it possible to calculate? What kinds of mathematical/arithmetic problems can we solve? Are there mathematical formulae whose solution can never be found by arithmetic means?" In fact, the limits of computation, as an idea, involves far more.

Why did Turing (and many others) think it was so important to establish the limits of computation? If it were possible to establish what these limits were, then it was possible to decide what were the limits to a calculating machine.

A calculating machine in this sense does not mean a calculator, or even an electronic computer, it merely means some machine which can be used to perform calculations automatically.

"Automatically" is the key word. It means that the machine is instructed on what to do, and goes ahead and does it. If a problem is outside the limits of computation, then the problem cannot be solved automatically. The means of solving the problem, which the machine follows automatically once instructed, is called the "algorithm".

If "intelligence" is outside the limits to computation, then there cannot be an intelligent machine. Turing thought intelligence was not outside these limits, otherwise he would not have proposed his test.

Turing (and Alonzo Church, independently) found that if a mathematical/computational problem could be expressed in a certain special form, then that problem was computable.

The special form was that known technically as "general recursive", but all we need to know for our purposes is that all conventional arithmetic is covered by this designation. If a function

was general recursive, then it was possible to solve the function by a method which had been specified in advance (the algorithm).

To illustrate what he meant by "computability" (ie, something within the limits of computation), Alan Turing devised a hypothetical machine — the Turing machine.

The idea was to try to take any algorithm, and turn the algorithm into a set of elemental acts. If sufficient of these elemental acts were performed, Turing believed that that would be enough for any possible computation. If something could be computed, the computation would be the result of many tiny separate little actions.

The Turing machine consisted of a device through which passed an infinitely long tape. On the tape there were distinct "squares", and on each square there might be a symbol. The device could perform only four distinct actions:

(1) Erase a symbol on a square, possibly print a new symbol on the same square, and perhaps enter a new state of action.

(2) Move the tape one square to the right, and perhaps enter a new state of action.

(3) Move the tape one square to the left, and perhaps enter a new state of action.

(4) Stop.

There were sets of instructions for the machine; ie, what and how to move between different states of action, given the symbols on the squares. These sets of instructions were themselves computable, and could be transferred on to the tape as a sequence of symbols.

To decipher the meanings of the sets of instructions for machines (the algorithms), we could design a special set of instructions (an algorithm). We would have a "super-algorithm" to analyse algorithms. The obvious question then becomes: Can the super-algorithm analyse the meaning of the super-algorithm? More recently, we might ask, "Can a program to write programs, write a program to write programs?"

Turing found the answer. The super-algorithm could not analyse itself: the super-algorithm is not computable, there are limits to computation.

What this means, in practical terms, is that there can be no such thing as a mechanical universal program generator.

The only universal program generator is a human being (or rather the collection of human beings known as humanity. Turing seemed to disagree with the implication that humans were not subject to his result, and so he invented his test to get around problems of computation.

The jargon for Turing's result is that there can be no Universal Decision Procedure. ■

Boris Allan

Puzzle

Double six

Puzzle No 78

If you examine an ordinary set of dominoes, you will find that there are 28 dominoes ranging from a double-blank up to the double six. However, in China it is not uncommon for sets to be enlarged further. For instance, by adding a further eight dominoes the set would then include all dominoes up to a double seven. Of course, for the game to be playable successfully it would be necessary to include all permutations of numbers up to the highest double. In fact, in China a standard set does contain no fewer than 55 pieces — that is dominoes up to a double-nine.



Legend also has it that sets have existed which were even larger than this. One such story tells how the Princess Ling-Ling was given a set of golden dominoes by the Prince Chang on the occasion of their betrothal. This set was made from solid gold, and the spots were inlaid diamonds — stones which had been cut by one of the Prince's distant ancestors in the 14th century.

The remarkable feature was that the number of diamonds used was exactly equal to the year (by Western calculation) in which this betrothal took place.

How many dominoes were there, and what was this date?

Solution to Puzzle No 73

As a six-digit square must have a square root in the range 317 to 999, the program tests every number, N, to check if it has this peculiar property:

```
10 FOR N = 317 TO 999
20 LET S = N * N
30 LET
SB = STRS S
40 LET T = VAL (SB(1) TO 3) + VAL
(SB(4) TO 6)
50 IF T = N THEN PRINT N
60 NEXT
N
```

Only one other number can be found with the characteristic that the sum of its two three-digit halves is equal to its square root. That number is 494209 = 703² = (494 + 209)².

Winner of Puzzle No 73

The winner is: Alexander Webster, Reid Street, Bumbank, Hamilton, Lanarkshire, who receives £10.

Top 10

- BBC***
- (3) Planetoids (Acornsoft)
 - (1) Snapper (Acornsoft)
 - (6) White Knight II (BBC Soft)
 - (4) Killer Gorilla (Program Power)
 - (7) 3D Bomb Alley (Software Invasion)
 - (5) Wordwise (Computer Concepts)
 - (8) Canyon (BBC Soft)
 - (9) Frogger (A-F)
 - (2) Countdown to Doom (Acornsoft)
 - (10) Demon Decorator (Program Power)
- *All Models B. 110m.

- Spectrum**
- (1) Scribble (Pison)
 - (2) Jet-Pac (Ultimate)
 - (3) The Hobbit (Pison)
 - (4) Flight Simulation (Ultimate)
 - (6) Trans Am (Ultimate)
 - (5) Horace and the Spiders (Pison)
 - (8) Horace Goes Skiing (Pison)
 - (7) Super Spy (Pison)
 - (10) SD Desert Patrol (Computer Rerails)
 - (9) 48 Diddums (Imagine)
- (Figures compiled by WH Smith and Son Ltd, London)

Top 10

- Dragon**
- (1) Ring of Darkness (Wintersoft)
 - (4) Frogger (Microdeal)
 - (6) Outpost Goes Walkabout (Microdeal)
 - (7) Shuttle (Microdeal)
 - (5) Champions (Peachpak)
 - (3) Mined Out (Quicksave)
 - (2) Night Flight (Salamander)
 - (8) Talking Android Attack (Salamander)
 - (9) Graphics System (Salamander)
 - (10) Franklins Tomb (Salamander)
- (Figures compiled by Boots & Co, London)

- Books**
- (1) Advanced User Guide for the BBC Micro, Bray, Dickens and Holmes (Cambridge Micro Centre)
 - (2) BBC Micro Book, Basic, Round and Graphics, McGregor and Watt (Addison-Wesley)
 - (3) Spectrum Hardware Manual, Dickens (Melbourne House)
 - (4) Structured Programming with BBC Basic, Asherton (Harcourt)
 - (5) Complete Spectrum from Assembly, Logan and O'Hare (Melbourne House)
 - (6) Advanced Graphics on the ZX Spectrum, Angel and Jones (Macmillan)
 - (7) Supercharge Your Spectrum, Webb (Melbourne House)
 - (8) VIC-20 Programmer's Reference Guide, Commodore (Commodore)
 - (9) Anatomy of the Dragon, James (Sigma)
 - (10) Commodore 64 Programmer's Reference Guide, Commodore (Commodore)
- (Figures compiled by Watford Technical Books, Watford 0823 23324)

Top 10

- Vic20**
- (1) Arcadia (Imagine)
 - (2) Wizard and the Princess (Melbourne House)
 - (4) Grid Runner (Imagine)
 - (6) Sky Hawk (Quicksave)
 - (7) Wacky Waters (Imagine)
 - (5) Paratrooper (Rabbit)
 - (3) Pacuade (Rabbit)
 - (8) Cancha Snatcha (Imagine)
 - (9) Panic (Bug-Style)
 - (10) Frantic (Bug-Style)
- (Figures compiled by Boots & Co, London)

- Z801***
- (1) Flight Simulation (Pison)
 - (2) Space Raiders (Pison)
 - (3) Espionage Island (Arctic)
 - (4) 1K Games (Arctic)
 - (5) Fantasy Games (Pison)
 - (6) Defender (Quicksave)
 - (7) QS Scramble (Quicksave)
 - (8) Football Manager (Additive Games)
 - (9) Ship of Doom (Arctic)
 - (10) 1K Chess (Arctic)
- *Runs in 10K except where shown
(Figures compiled by Boots & Co)

Top 10

- Atari**
- (1) Miner 2049er (Big Five)
 - (2) Preppie II (Adventure International)
 - (3) Pico (DataSoft)
 - (4) Zork I (Infocom)
 - (5) Regton (Sirius)
 - (6) Ultima II (Sierra On-line)
 - (7) Deadline (Infocom)
 - (8) Empire of the Overmind (Avaton Hill)
 - (9) Close Assault (Avaton Hill)
 - (10) The Blade of Blackpool (Sirius)
- *Cartridge, 132K cassette, 632K disc, 248K disc.
(Figures compiled by Calisto Computers, Birmingham 021-652 6458)

Morris meets the Bikers

NEW

ONE DAY, THE PIMAN IS
DISTURBED BY A STRANGE
VISITOR.

EVENING, SQUIRE! SWETTBITZ
IS ME NAME - DOIN' PIMEN
FAMOUS IS ME GAME!

COOKS!

I'VE GOT A SHIP
OUTSIDE YOU JUST
WON'T BE ABLE TO
RESIST!

WOW! I'VE ALWAYS WANTED A
SPACE-BAGGY! HOW MUCH?

WELL, 'OW MUCH
'AVE YOU GOT?

A POGO-STICK, A
SAW-CYCLONE AND
A CAN OF WORKS
WELL THAT'S 'OW MUCH IT IS!
SIGN HERE HERE AN HERE!

BWOOSH!

TATTAN MUGGINS!

OH, I THOUGHT
I'D JUST BOUGHT THAT!

LOOK AT THE LUG-BAG!
IT'S A NEW! HE PAID TWO
HUNDRED EARNED WORKS
FOR! BEEP!

EH, WOT?

THE NAME'S MORRIS,
BALDY! WHEN'S GRUB?

HOLD YOUR HORSEPOWER!
I INTEND TO GET MY
POGO-STICKS WORTH OUT
OF YOU!

WHAT DO YOU KEEP
STOPPING FOR?

BEER! CAR
SICKNESS!

LAY BY
IT

MULTI-STORY
CAR PARK

I'VE ER-GOT TO DO
MY SHOPPING, YOU
CAN WAIT IN HERE!

AAGH! BEEP.
NO! I GET
CLAUSTROPHOBIA!

LEMME OUTTA
HERE, YA BUM!

NOW TO RETRIEVE
MORRIS, SO THAT I CAN
SELL HIM TO SOME OTHER
MUG! GO, MY FANTASTIC
THRECKY BIKERS!

I'M FREE!
TAKEEE!

THE RAT'S ABANDONED
ME! I'VE GOT TO GET OUT
OF HERE BEFORE THE
BIKERS COME AGAIN TO
TAKE ME BACK TO OLD
SWETTBITZ! BEEP!

TOO LATE! THE
MAD BIKERS
BLAZE IN, LIKE
GHOSTS THROUGH
THE BACK WALL

SO BEGINS THE CHASE...
MORRIS IS THWARTED BY
WISITRAT SHAPS AND
LOOPY LIFT-SHAPS.

TRACHEROUS
TIN-TACKS THAT
SLOW HIM DOWN...

YOW!

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GRAB!

CRUNCH!

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THAT BRING HIM TO A
GRINDING HALT...

HE NEEDS PRECIOUS
PETROL FOR STAMINA...

CRASH!

AND HAS TO COLLECT TEN
GOLDEN COINS BEFORE HE
CAN ESCAPE THROUGH THE
EXIT TO THE NEXT SCREEN.
THERE ARE 9 SCREENS
ALTOGETHER, BEFORE HE IS FREE!

MAYBE WE DON'T LIKE THE
NOISE HIS HORN MAKES, AND
MAYBE WE CAN'T GET HIM
IN THE LIFTS - BUT WE CAN
FLY THROUGH WALLS, AND WE
DON'T CARE ABOUT NO HAND
SIGNS - OR DOUBLE
WELLER LINES! WAR WAR!!

OH! GASP!

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the BIKERS
FOR 16K or 48K
ZX SPECTRUM.
RESCUE MORRIS!! £6

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"DON'T MISS MY TEAR-
JERKING REPRODUCTION OF
'LEADER OF THE PAC'
ON THE FLIPSIDE OF
THE CASSETTE!"

